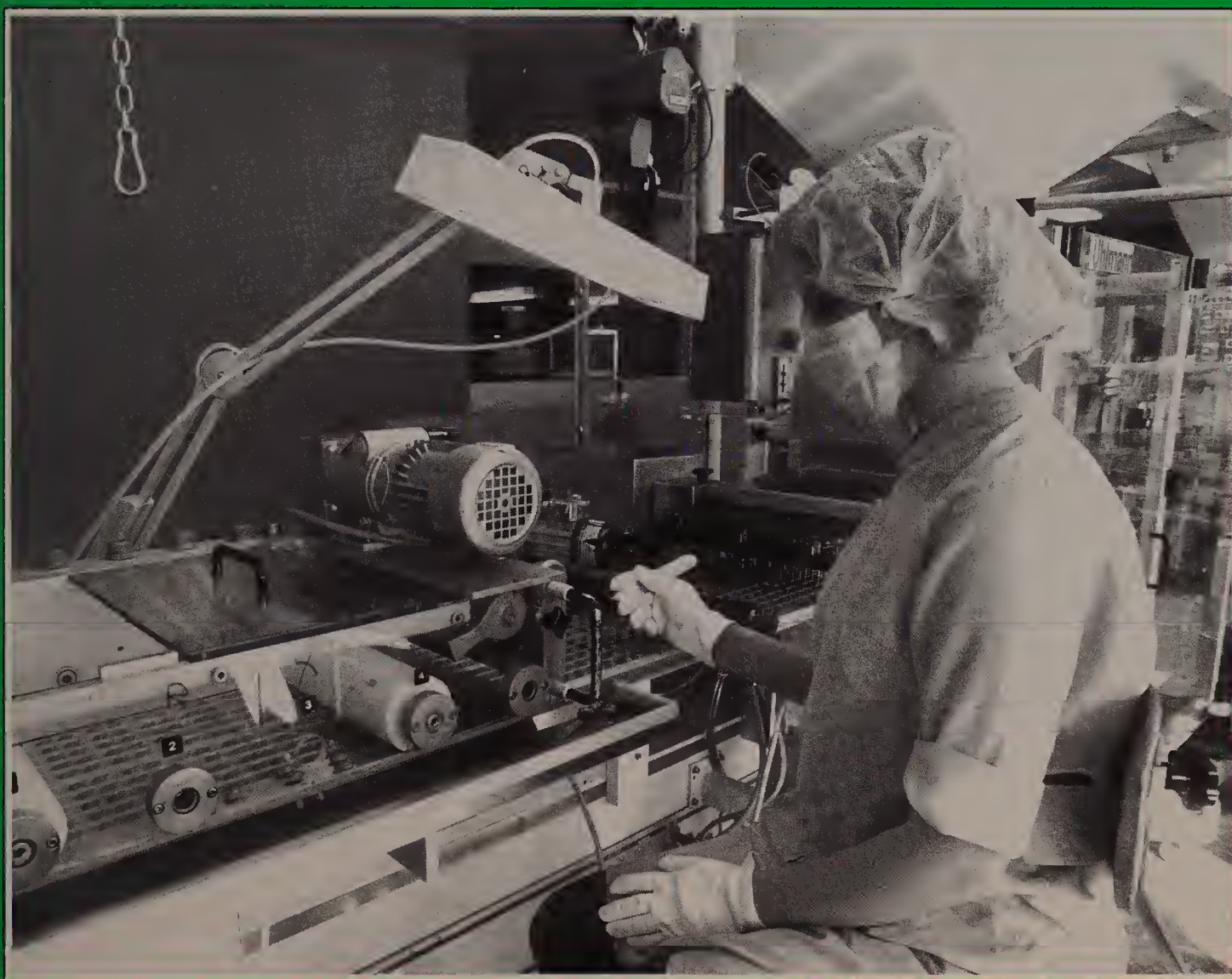


Chemistry International

The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



1991, Vol. 13. No. 1 (January)

Blackwell Scientific Publications

Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Six issues of *Chemistry International* will be published in 1991. The 1991 subscription rate including postage is GBP 37.50 (UK), GBP 37.50 (overseas except North America) USD 58.00 (US and Canada). The individual subscription rate is USD 33.00. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Blackwell Scientific Publications Ltd, PO Box 88, Oxford, UK.

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Despatch. The news magazine is despatched within Europe by surface mail, to other continents by various forms of air speeded delivery: to the US* by air freight for forwarding by second class post, to India by air freight for guaranteed local delivery, and to all other countries by Accelerated Surface Post.

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Unless there is a footnote to the contrary, reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*.

This journal is included in the ADONIS service, whereby copies of individual articles can be printed out from compact discs (CD-ROM) on demand. This ADONIS number given below each article is to be used to order a document. An explanatory leaflet giving further details of the scheme is available from the publishers on request.

*Second class postage paid at New York, NY. Post Master, send address changes to *Chemistry International*, c/o Mercury Airfreight International Inc., 2223 Randolph Avenue, Avenel, NJ 07001, USA.

Front Cover: In this pharmaceutical packing line, tablets, capsules and dragées are sealed in airtight blister packs. (Photo courtesy Roche.)

Fooling around at conferences and— congresses

Editorial

What exactly is a 'conference' as opposed to a 'congress' or 'symposium'? It is unlikely that the organizers of the 34th International Symposium on Macromolecules (to be held in Prague in 1992, incidentally) and other well established series of symposia will be too concerned with this question. Presumably they know what a symposium is.

However, the organizers of the 1st International Colloquium or Conference or Congress or Symposium on Coordinated Body Chemistry may well require guidance on which term to use. I therefore thought it might be helpful to do some research on the subject and report my findings.

My first step was to collect together as many terms as possible related to the word 'conference'. The computer which I use for word processing can, in principle, do this at the touch of a button. By simultaneously pressing the 'Control' and 'F6 function' keys on the keyboard, the computer screen will display, in a few seconds, a thesaurus selection for any word I choose to highlight. I therefore looked up the word 'conference' in the thesaurus. Almost immediately an impressive array of words appeared including (in alphabetical order): advisement, care, caucus, chat, colloquy, council, counsel, inter-course, parley, powwow, and tête-à-tête.

I must confess that the word 'advisement' looked a bit strange to me and I am not familiar with the

use of 'care' as a synonym for conference (could the computer have made a mistake?). The thesaurus also gave: symposium and several other words. For some reason 'seminar' and 'congress' failed to get a mention.

I therefore checked the computer's thesaurus to see what it could achieve with the word 'congress'. To my utter surprise (although I should have known better) a group of words concerned with sexual relationships came top of the list. The most innocuous of these was the term 'fooling around'.

But is food provided?

The original idea for an editorial on 'conferences' and related terms came from the IUPAC Executive Secretary Dr Mo Williams back in 1986 following conversations with Prof. Ernó Pungor who is Chairman of the Organizing Committee of the 33rd IUPAC Congress. This congress will be held in Budapest, Hungary in August 1991 (see *CI*, Vol. 12, No. 5, pp. 202–3, 1990).

Pungor and Williams had somehow come up with the idea that participants are provided with food at conferences but not at symposia. I think they were serious about this but I was not too happy with the distinction. Since 1986 I have put the matter to test at various conferences, congresses and symposia



Is this an assembly, conference, seminar, symposium or just a plain meeting?

and have found that food (or at least lunch) has always been available, although not necessarily provided.

The only answer then was to do the obvious — to look these words up in some English dictionaries.

The nomenclature of 'meetings'

Some of the dictionaries were somewhat vague and their definitions overlapped considerably. For example, an 'assembly' tended to be defined as an 'act of assembling' and a 'convention' as an 'act of convening'. This is not very helpful when an organizer is convening an assembly and wants to know what to call the meeting. Colloquia and symposia were often defined as conferences or meetings and conferences as meetings.

The following alphabetical 'Guide to meetings nomenclature' is based on my dictionary investigations and my own experience of meetings. It should not be regarded as definitive but rather the starting point for discussions on the subject.

Assembly. This type of meeting is generally regarded as the act of assembling or the putting together of parts.

It is also a deliberative or legislative body. IUPAC holds its general assemblies every 2 years. The assembly consists of a set of meetings of IUPAC bodies (or parts) such as the Council, Bureau, commissions and standing committees. These are principally business or administrative meetings rather than scientific meetings.

Colloquium. This is variously described as a conference, a meeting for discussion, or a seminar. The key probably lies in the French and Latin origins of this word which imply speaking, conversing and therefore oral contributions.

Conference. This is an appointed meeting for instruction or discussion. The emphasis is on conferring or possibly consultation. Thus, at a scientific conference, scientists confer or consult with one another.

Conference. This is the act of getting together which explains the sexual connotations. IUPAC-sponsored congresses tend to be wide-ranging scientifically.

Typically, several sections or symposia on very distinct scientific topics are held in parallel sessions.

Convention. This term is generally defined as the act of convening or an assembly — especially of representatives or delegates for some common object. As far as I am aware this term has never been used for a IUPAC meeting.

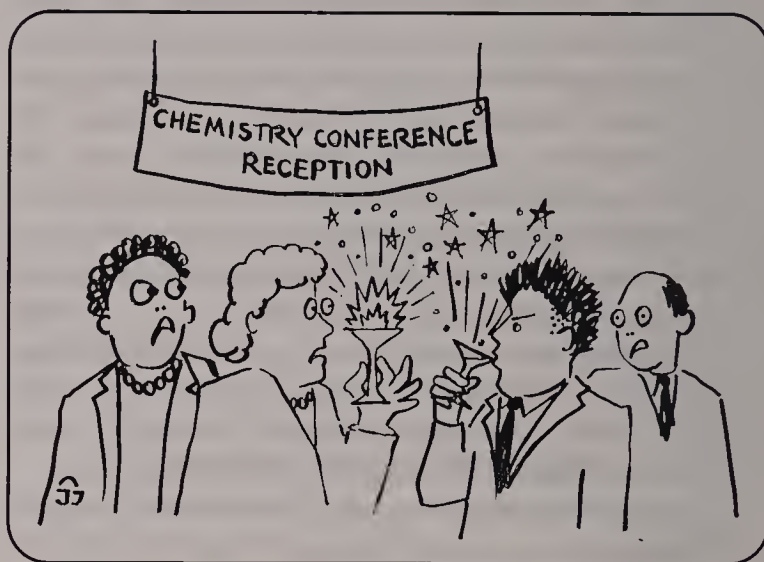
Meeting. This is the common denominator of all the

other terms. It means coming face to face with or into the company of one or more other persons.

Seminar. This is a group or small class of advanced students working on or discussing a specific subject of study or research under a teacher. It is also a discussion group or conference of specialists on any specific topic.

Symposium. This is where meetings terminology gets a little interesting. Historically a symposium is a drinking party or more specifically, an ancient-Greek after-dinner drinking party with music, dancers or (and I repeat 'or') conversation. A symposium is also defined as a collection of views and contributions on one topic.

Workshop. This is a group of people working on a creative or experimental project.



Editorial comment

Within IUPAC circles the two terms 'conference' and 'symposium' seem to be used interchangeably to some extent although, if a distinction has to be made, I suspect a symposium is more narrowly focused than a conference. For example, in the conference calendar (should it be 'meetings calendar'?) for 1991 at the back of this issue, we can compare the broadly focused 7th International Conference on Surface and Colloid Science with the more specialized 4th International Symposium on Macromolecule-Metal Complexes.

I particularly like the historical definition of 'symposium' mentioned above. Perhaps, after all, the Pungor and Williams distinction is correct: could it be all drinking and dancing but no eating at symposia?

No doubt, within the wide readership of *Chemistry International*, there are some people who really are experts or experienced in this subject. If so please write in. We would welcome a few more letters in our 'Letter(s) to the Editor' section.

Michael Freemantle

Affiliate Membership Programme in Czechoslovakia



The affiliate membership programme in Czechoslovakia was launched in 1987. Every year since then, between 220 and 240 chemists in the country have enrolled as IUPAC affiliates.

The programme is operated from the headquarters of the Czechoslovak Chemical Society (Československá Společnost Chemická) which is located in Hradčany near Prague Castle and the Gothic St Vitus Cathedral which dominates the Prague skyline (top right). The National IUPAC Affiliate Membership Secretary in Czechoslovakia is Ing. Karel Jindra (centre, right) who is Executive Secretary of the society.

The photograph also shows Dr Václav Chvalovský (centre, left) who is Chairman of the Czechoslovak National Committee of Chemistry. This is the IUPAC National Adhering Organization in Czechoslovakia.

The address of the society is: Československá Společnost Chemická (Czechoslovak Chemical Society), Hradčanské Nám 12, Hradčany, Prague 1, Czechoslovakia.

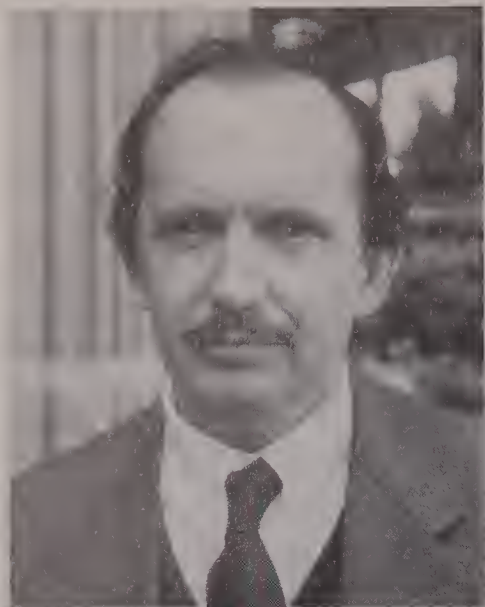
Turkish Chemical Society

The Turkish Chemical Society (TCS) has actively supported the IUPAC affiliate membership programme ever since it was launched in 1986: currently over 40 TCS members are IUPAC affiliates.

Prof. Mustafa Berkem, National IUPAC Affiliate Membership Secretary of Turkey, writes that TCS was founded in 1919 — the same year as IUPAC was founded. At present the society has about 2000 members. TCS membership is open to those who possess a diploma in chemistry. They are admitted

by the TCS Executive Committee on the recommendation of two other members. Persons who have contributed to the aims of the society may also be admitted as honorary members.

TCS is governed by an annual general assembly of members and its administrative council. The council consists of nine members elected by secret ballot of active members every year. The society is financed by individual membership fees — there are no official state subventions.



Prof. Mustafa Berkem is National IUPAC Affiliate Membership Secretary of Turkey.

TCS activities are principally oriented towards the advancement of chemistry. Publications, confer-

ences and meetings are all directed towards this goal. The society publishes the *Monthly News Bulletin* and also, four times a year, *Chemistry and Industry*.

Since 1958, TCS has been the Turkish National Adhering Organization of IUPAC with three delegates to Council. It also has several national representatives on various IUPAC commissions and committees.

The society is a member of the Federation of European Chemical Societies (FECS) and the International Organization for Sciences in Development (IOCD). It has collaborated with the Chemical Societies of Balkan Countries.

The address of TCS is: Türkiye Kimya Derneği (Turkish Chemical Society), Halaskârgazi Caddesi No. 53, D. 8 Uzay Apartmanı, 80230 Harbiye, Istanbul, Turkey. Tel: +90 (1) 140 73 31.

Affiliates in action



Affiliates (from left): Shô Itô (member of IUPAC Executive Committee); Prof. R. Vlahov (Bulgarian Academy of Sciences); and Roy Greenhalgh (Secretary, Applied Chemistry Division).

IUPAC affiliates have contributed in various ways to IUPAC-sponsored conferences covered in this issue of *CI*.

For example, affiliate Dr Bohumir Valter (Czechoslovakia), is Deputy Chairman of the Prague Meetings on Macromolecules. A report on the 13th Discussion Conference in this series appears on pages 15–19.

Affiliates contributing to the 27th International Conference on Coordination Chemistry held at Broadbeach, Australia included Vincenzo Balzani (Italy) and Reed M. Izatt (USA). Their contributions to the conference were published in the June 1990

issue of *PAC* and are reviewed on page 29 of this issue of *CI*.

The following affiliates were all authors or co-authors of papers presented at the 17th International Symposium on the Chemistry of Natural Products held in New Delhi, India: Mohyee Eldefrawi (USA); G. B. Elyakov (USSR); R. Vlahov (Bulgaria); Roy Greenhalgh (Canada); Marc Savard (Canada); Curt R. Enzell (Sweden); Dick van der Helm (USA); Guy Ourisson (France); and Shô Itô (Japan). Their papers were published in the July 1991 issue of *PAC* and are reviewed on pages 29–31 of this issue.

Information for Affiliates

Inorganic nomenclature

A report based on the 1990 Newsletter of the Commission on Nomenclature of Inorganic Chemistry (CNIC) is published in this issue of *CI*. In the report, Stanley Kirschner (Department of Chemistry, Wayne State University, Detroit, Michigan, USA) invites readers to write to him about ligand abbreviations. The report also encourages readers to contact CNIC on nomenclature matters. Names and addresses are given.

Photochemistry

The Commission on Photochemistry invites photochemists to comment on any aspect of the commission's activities or to suggest new topics as projects. The report of the latest commission meeting appears in the Commission and Committee News section of this issue of *CI*. The commission also invites comments on its document 'Recommended methods for fluorescence decay analysis' published in *PAC* (Vol. 62, No. 8, pp. 1631–48, 1990).

Comments should be sent to the Commission Secretary: David F. Eaton, The Du Pont Company, Central Research and Development Department, Experimental Station, PO Box 80328, Wilmington, Delaware 19880-0328, USA.

CAS Statistical Summary

In this issue of *CI*, IUPAC affiliate Dr W. Val Metanowski reports on the latest Chemical Abstracts Service (CAS) Statistical Summary: 1907–1989. Metanowski, who is Senior Editorial Advisor, CAS Editorial Operations, was the author of 'Unusual names assigned to chemical substances' which appeared in the November 1987 issue of *CI* (pages 211–15) and attracted much interest. He is an associate member of the Commission on Macromolecular Nomenclature (IV.1).

The address of Dr W. V. Metanowski and the Chemical Abstracts Service (a Division of the American Chemical Society) is: 2540 Olentangy River Road, PO Box 3012, Columbus, Ohio 43210, USA. Tel: +1 (614) 447 3600. Fax: +1 (614) 447 3713. Telex: 6842086.

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC commissions. A full list of names and addresses of all commission officers for 1989–1991 was published on pages 225–35 of the November 1989

issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

Free copies of booklet available to affiliates

Copies of an attractive 64-page illustrated booklet on *The IUPAC programme on chemistry and the environment* have been distributed to members of IUPAC commissions and committees, national adhering organizations and other bodies associated with IUPAC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Affairs Secretary.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually — but not always — announced in the conference circulars and indicated on the registration form.

To receive this reduction, an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively, the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal.

In some cases an affiliate may find it helpful to produce a certificate of affiliate membership to support his/her application for a reduction. The Secretariat is happy to supply, upon request, an affiliate certificate valid for the current year.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.



Reduced IUPAC congress fee for affiliates

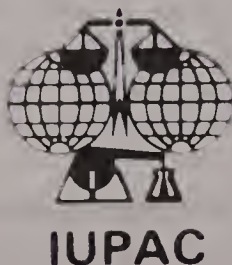
The 33rd IUPAC Congress will be held at the Budapest Sports Palace from Saturday 17 to Thursday 22 August 1991 (see page 202-3 of the September 1990 issue of *CI*). The registration fee for **affiliates** is USD 252 if received before March 10th. This represents a 10% reduction on the congress fee of USD 280 before this date. The registration fee, if received after 10 March, is USD 350 for both affiliates and non-affiliates.

Further information and registration forms from: 33rd IUPAC Congress, Prof. E. Pungor, c/o Hungarian Academy of Sciences, H-1111 Budapest, Gellert ter 4, Hungary. Tel: +36 (1) 664 705. Fax: +36 (1) 851 477. Telex 225931 MUEGY H.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International (CI)*, please indicate that the letter is 'Submitted for publication in *CI*'.

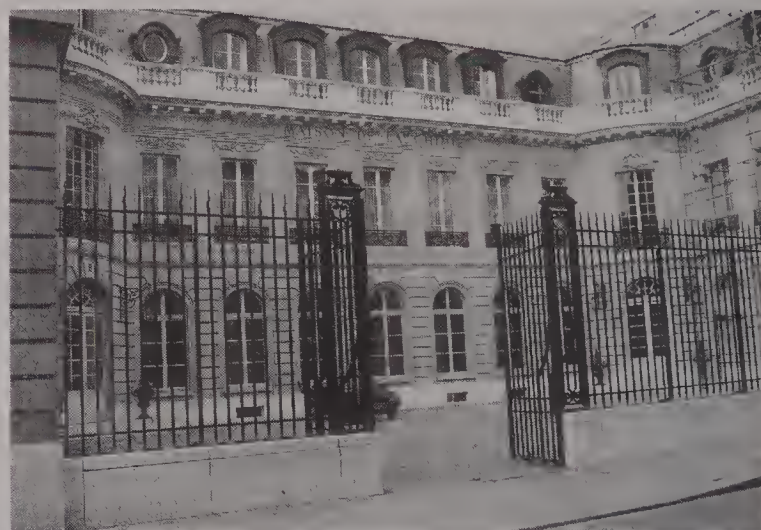
Affiliate Affairs Secretary
IUPAC Secretariat, Bank Court Chambers,
2-3 Pound Way
Templars Square
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Oxford OX4 3YF
UK
Tel: +44 (865) 747744
Fax: +44 (865) 747510
Telex: 83220 IUPAC G



Maison de la Chimie Foundation Prize

Entries are invited for the 1991 Maison de la Chimie Foundation Prize which will be awarded to one or several persons, irrespective of nationality. The prize, which has a value of FRF 150 000, is intended to reward original work in chemistry of benefit to mankind, society or nature.

All entries must be presented through a learned society or through a national or international scientific organization. The entries will be judged by an international jury composed of a chairman and nine members recognized for their work in the different fields of chemistry. The laureate will be invited to present an account of his/her work at the prizegiving ceremony in November 1991.



Maison de la Chimie, Paris.

Entry forms, accompanied by a report in English or French, must be returned before 31st March 1991 to the Secrétariat, Prix de la Fondation de la Maison de la Chimie, 28, rue Saint-Dominique, 75007 Paris, France. Tel: +33 (1) 47 05 10 73. Fax: +33 (1) 45 55 98 62. Telex: 200 351 CHIMIE PARIS.

Low-molar-mass liquid crystals

On page 26 of this issue, Commission IV.1 Secretary William J. Work reports that the Commission on Macromolecular Nomenclature is seeking collaboration with authorities in low-molar-mass liquid crystals to help with the commission's project on terminology of liquid crystals. If you are an expert in this field and wish to help please contact the commission directly.

The address is: Dr William J. Work, Research Division, Rohm and Haas Company, PO Box 219, Bristol, Pennsylvania 19007, USA. Tel: +1 (215) 785 8549. Fax: +1 (215) 781 0624.

Ten million – and growing

In 1990, the Chemical Abstracts Service registered the 10-millionth chemical substance and published its 13th millionth abstract. IUPAC affiliate Dr W. Val Metanovski reports.

Every year, Chemical Abstracts Service (CAS) publishes a statistical summary indicating the number, type, and source of documents abstracted and indexed since 1907, and providing additional data for the last three decades, such as the source and the language of journal literature, and the country of issue of patents abstracted and cited in *Chemical Abstracts (CA)*. In addition, the growth of the CAS Chemical Registry System is shown.

According to the 1907–1989 summary, in 1989 CAS abstracted and indexed 489 191 scientific papers, patents and other publications, and additionally cited 112 437 equivalent patents. The respective grand totals since 1907 were 12 732 372 abstracts and 601 628 additional patent citations.

The abstracted documents reported on research and development performed in 155 countries. US chemical research and development accounted for the largest share of the journal literature. Of the 397 158 journal articles, dissertations, conference papers, and technical reports abstracted in 1989, 27.8% reported work performed in the USA. The USSR was the second leading source of chemical papers in 1989 with 12.7%. Other major sources of papers in 1989 were Japan (11.8%), the Federal Republic of Germany (6.2%), the UK (5.7%) and France (4.2%). The People's Republic of China was the source of 3.7% of the papers abstracted in 1989, up from less than 1% 10 years ago.

Japanese patents made up over 54% of the 88 099 patent documents CAS abstracted in 1989. The European Patent Office provided 12.3% of the

patents abstracted, followed by 7.4% from the USA Patent Office and 5.7% from the USSR. CAS abstracts patents issued by 27 nations and two international patent-issuing organizations.

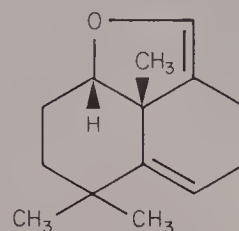
Although English-language papers made up the bulk of the chemical literature abstracted by CAS in 1989, 44 other languages were represented. Nearly 74% of the scientific papers abstracted were published in English, 11.7% were in Russian, and 4.4% were in Japanese. German and Chinese accounted for 3% each.

Publications abstracted during 1989 reported 571 875 new chemical structures, which were recorded in CAS's computer-based Chemical Registry. Another 44 112 substances were added to the CAS Registry during the year as part of a project to register substances indexed by CAS prior to 1965. The CAS Registry, which now records virtually all chemical substances reported in the scientific literature since 1957, contained information on 9 912 619 unique substances at the end of 1989.

An analysis of 5-year data from 1984 to 1989 shows the growth of scientific activity in biotechnology and materials science as reflected by dramatic increases in the numbers of abstracts in certain subject sections of *CA*.

Section 3, Biochemical Genetics, has nearly doubled in total numbers of abstracts since 1984, with a 91.8% increase. During the same period, the number of abstracts on ceramics grew by 24.1% from 1988 to 1989 alone.

In 1990, CAS registered the 10 000 000th chemical substance:



cis(±)-4,6,7,8,8a,8b-hexahydro-6,6,8b-trimethyl-3H-naphtho[1,8-bc]furan [125417-03-0].

reported by two Japanese researchers in a British journal (*CA* 112 (13):119171c).

Also in 1990, CAS reached another milestone by publishing the 13 000 000th abstract, which reported on a paper from the People's Republic of China on 'Color reaction of thorium with chlorophosphonazo-DBC and its application' (*CA* 113(2):17127w).



CAS document analyst, Sook Shin, edits abstracts and index entries for *CA*.

Chemistry International: guidelines— for authors



Chemistry International (CI) is the news magazine of the International Union of Pure and Applied Chemistry (IUPAC). The aims of the magazine are:

- to be informative about IUPAC and especially its scientific work;
- to be interesting and readable; and
- to provide a forum for the expression of views.

The magazine publishes news, views and reports on IUPAC, its people, its commissions and committees, its national adhering organizations (NAOs), its associated organizations, its company associates, its affiliate membership programme, its meetings, its publications and recommendations, and its conferences. It also publishes feature articles on topics linked to the work of the Union.

CI has a world-wide readership consisting mainly of members of IUPAC bodies, IUPAC affiliates and other scientists interested in the work of the Union – including chemistry teachers in schools and colleges, university lecturers and professors, and chemists working in industry and public service.

Types of contribution

The editor is happy to consider unsolicited contributions and suggestions for contributions for publication, especially from affiliates and members of IUPAC bodies. There is particularly a need for short items, and letters are always welcome. Intending authors of feature articles and short reports are advised to contact the editor before submitting their material.

All articles and reports should be linked to IUPAC, its work and its interests. Feature articles and shorter items should be of general interest to chemists who are not specialists in the subject of the article. Specialist terms, acronyms and abbreviations should therefore be explained. However, generally accepted acronyms and abbreviations (e.g. DNA and NMR) may be used. Care should be taken to avoid jargon and colloquialisms. IUPAC nomenclature and SI units should always be used.

Authors are usually invited to submit black and white photographs and/or figures to illustrate their articles or reports. Authors should aim to provide, if possible, one photograph or illustration, for every 500 words of text.

Feature articles. Feature articles of up to 3000 words are published in *CI*. Some are solicited, others unsolicited. Unsolicited articles are sent to referees for comment. An author of a feature article is invited to write an introductory paragraph summarizing the

article. This should include some reference to IUPAC. The paragraph is printed in bold at the beginning of the article.

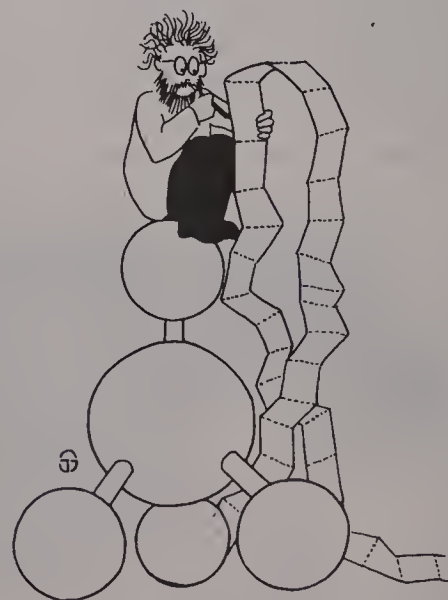
Commission & Committee News. Items in this section are based on summary minutes of commission and committee meetings. Guidelines on how to write summary minutes for *CI* are sent to all commission and committee chairmen and secretaries each year.

Short reports. Short reports and news items of up to 1000 words on conferences, the work of IUPAC commissions and committees, associated organizations, affiliate activities and so on are welcome.

Filler items. Filler items of up to 200 words are also welcome. Humorous items, anecdotes, verse and quotations are all acceptable and may be accompanied by cartoons, figures or photographs.

Letters. *CI* has a correspondence column, the aim of which is to provide a forum for the expression of views on IUPAC and its activities. A correspondent should make clear to the editor that the letter is intended for publication! It should normally not exceed 500 words and may be accompanied by a cartoon or photograph.

Cartoons. Most issues of *CI* contain at least two cartoons. These usually relate to some aspect of the work of the Union. Cartoons and ideas for cartoons submitted by affiliates and members of IUPAC bodies will always be considered for publication.



Photographs. Photographs of IUPAC activities and IUPAC people in the news are published in the News and Views section of *CI*.

Obituaries and tributes. *CI* does not publish obituaries and tributes. However, it does announce the deaths of scientists who have worked on the Union's commissions and committees.

Correspondence

Correspondence, contributions and enquiries should be directed to:

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IUPAC Secretariat

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Oxford OX4 3YF

Tel: +44 (865) 747744; Telex: 83220 IUPAC G;
Telegrams: IUPAC OXFORD; Fax: +44 (865) 747510

Submission and acceptance of contributions

The editor, in consultation with the *CI* Editorial Advisory Board, reserves the right to accept, reject and edit, in accordance with editorial policy and *CI* style, all material submitted for publication. Feature articles, when edited, are normally referred back to the author(s) for comment and approval. Proofs are not sent to authors.

Presentation. All articles, reports and other items should be typed or printed with double spacing on one side only of white A4/American quarto paper using margins of at least 3 cm.

All items should clearly indicate the title and name of the author(s). Each page of typescript should be numbered together with the name(s) of the author(s).

Tables and references should be presented in the usual style of *CI*. Authors are asked to refer to recent issues of *CI* to determine this style. The use of references should be kept to a minimum, but each reference should be supplied with all available details.

Use of titles and first names. When authors refer to other scientists in their articles or reports they should, wherever possible, give their titles and first names as well as their family names, for example: 'Professor Joseph Bloggs' is preferred to 'J. Bloggs'.

Illustrations. Figures should be submitted on separate sheets and numbered to link in with the

text. Figures and cartoons may be redrawn by editorial staff or the publishers.

Photographs should be large, glossy, black and white prints. In certain cases, however, colour prints are acceptable. Transparencies and negatives should not normally be submitted.

All figures, cartoons and photographs should be accompanied by suitable captions where appropriate.

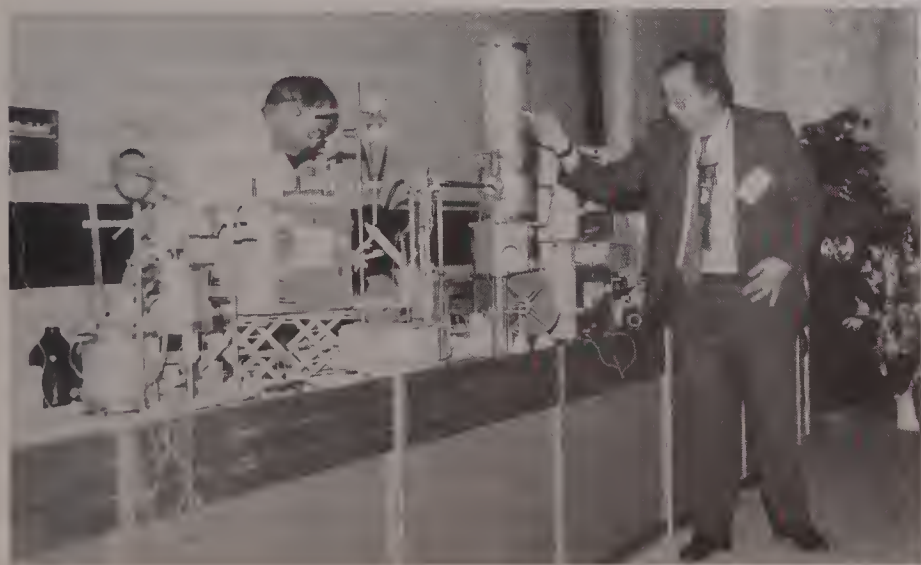
The author(s). Authors of feature articles are invited to submit a paragraph or two about themselves, their work and their links with IUPAC and also a black and white photograph. This can be a head and shoulders photograph or preferably a photograph showing the author at work — in an office or laboratory, for example.

Publication schedule. The publishers of *CI* operate on a 9 week production schedule. Authors of even the most 'urgent' material should allow at least 1 week for editing at the IUPAC Secretariat. The *minimum* time, therefore, between receipt of material at the Secretariat and publication is 10 weeks. This period can be considerably longer — especially if a deadline is just missed.

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Uncertainties in atmospheric carbon-dioxide concentrations

Sjaak Slanina

In July 1990, the Commission on Atmospheric Chemistry held a workshop in Petten, The Netherlands, on the assessment of uncertainties in the projected concentrations of carbon dioxide in the atmosphere. Commission Chairman Sjaak Slanina introduces the topic and summarizes the papers presented at the workshop.

The greenhouse effect

The greenhouse effect has attracted a lot of attention in the media. The increased concentrations of the so-called radiatively active gases which contribute to the greenhouse effect will lead to higher temperatures on earth. The increased temperatures are caused by these gases transmitting short-wave radiation from the sun whilst at the same time absorbing infra-red and ultra-violet radiation and visible light emitted from the earth. As the concentration of these gases increases, less of the earth's infra-red radiation escapes into space. The result is that the earth's atmosphere is warming up.

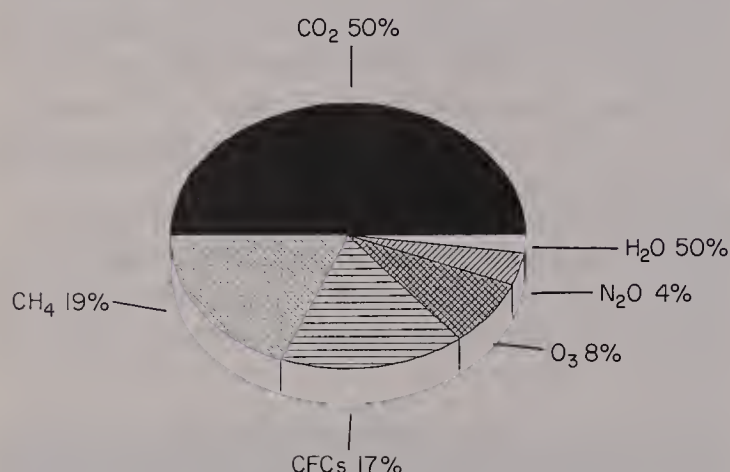


Fig. 1. Relative contributions of radiatively active gases to temperature rise.

The contributions of the most important radiatively active gases are shown in Fig. 1. The main influence is exerted by CO₂, but the contributions of other compounds, especially methane, cannot be neglected. As Table 1 indicates, the concentration of these radiatively active gases is increasing significantly each year. For example, the concentration of

Table. Concentration and increase of radiatively active gases

Compound	Concentration (p.p.m. (v/v))	Increase (% per year)
CO ₂	356	0.4
CH ₄	1.7	1
N ₂ O	0.3	0.3
CFCs	0.0005	5



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CO₂ has increased from 283 p.p.m. in 1880 to 356 p.p.m. at present.

The effects of this retained radiation has been intensely debated over the past 2 years. A general temperature rise ranging from 0.5 to 7°C over a period of 50–100 years has been predicted on the basis of model calculations.

The most important changes would be observed in the temperate zones. The average sea level would rise, due to expansion of sea water, as a function of increased temperature of the oceans, and to melting of glaciers, the ice-cap of Greenland or even to Antarctica. This rise of sea level would endanger coastal countries such as Bangladesh. Patterns of precipitation would change, causing large shifts in agriculturally productive areas.

Local effects could also contribute to changes in climate. It is feared that the course of the main currents in the oceans, such as the Gulf Stream, could change, with the results that, for instance, the warm ocean water of the Gulf Stream would no longer temper the winters in Northwestern Europe.

All these predictions are subject to a large margin of uncertainty. The effects of increased retention of heat in the atmosphere are very difficult to predict at the present stage of meteorological modelling. Some models assume that formation of clouds is enhanced at higher temperatures, resulting in a negative feedback loop with temperature. More reflection of sunlight takes place, which counteracts the effect of the radiatively active gases.

Most models describe a decrease of the ice-cap on Antarctica, but in some studies the opposite effect is postulated: the ice-cap grows as a result of enhanced precipitation on Antarctica.

However, the basis of all these predictions, namely the assessment of the future concentrations of the radiatively active gases in the atmosphere, is already quite uncertain. It is very difficult to describe the trend of concentrations of CO₂, CH₄ or N₂O for the next 50 or 100 years.

IUPAC workshop

The uncertainty regarding the increase of CO₂ concentration in the atmosphere, in view of its possible impact on climate, prompted IUPAC to organize a workshop on the assessment of uncertainties in the projected concentrations of CO₂. The Commission on Atmospheric Chemistry (VI.4) of the Applied Chemistry Division together with ECN (The Netherlands Energy Research Foundation) were responsible for the organization.

The aim of the workshop was to investigate the uncertainty of the most important sources and sinks. The uncertainties in these sources and sinks are obviously important factors in all predictions of the future atmospheric concentrations. However, not only are the sources and sinks important but also other factors such as the interactions between future CO₂ concentrations and the level of other pollutants.

An example is the fertilization effect of coastal waters. Higher concentrations of nitrates, phosphates and sulfates can lead to enhanced growth of micro-organisms leading to a larger uptake of CO₂ by these waters. A connection could exist between CO₂ concentration and future climate, as increased temperature and precipitation can lead to faster growth and larger uptake of CO₂ by vegetation. But these links cannot be quantitatively addressed at this point of time, so they were not part of this workshop.

Other gases, which are radiatively active, could have a large influence on changes of climate. However, in order to discuss the problems of the CO₂ cycle in depth, it was decided to limit the scope to this particular gas.

The organizers identified four major causes for the uncertainty in the projections of future CO₂ concentrations.

1. Emissions by deforestation and changes in land use.
2. Uptake of CO₂ in the form of a fertilization flux (growth of vegetation is enhanced at higher CO₂ concentrations).
3. Uptake of CO₂ by the oceans.
4. Emissions due to the use of fossil fuels.

The first item has been the subject of a number of recent symposia, so it was decided to focus on the latter three. A number of experts on different aspects were asked to present papers.

- Dr Jae Edmonds: Uncertainties in energy scenarios and their consequences for CO₂ emissions
- Dr Gerd Esser: Uncertainties in the dynamics of biosphere developments with the accent on deforestation
- Dr Jan Goudriaan: Uncertainties in biosphere/atmosphere exchanges and CO₂-enhanced growth
- Dr Peter Tans: Overall atmospheric trend assessment
- Dr David Turner: Air/sea exchange



Uptake of CO₂ by the oceans is one of the four major causes of uncertainty in projected future CO₂ concentrations.

The following members of the Commission on Atmospheric Chemistry were invited to present short papers on national or regional recognition of the greenhouse issue and the consequences thereof, especially regarding adaptation or limitation strategies: Dr Hajime Akimoto (Japan), Dr Hans-Jörg Grosse (GDR); Dr Ulviye Özer (Turkey); Dr Xiaoyan Tang (China); and Dr Tania Tavares (Brazil).

The workshop was chaired by Dr Sjaak Slanina and Dr Peter Okken, who will also act as editors of the final report of the workshop, on behalf of Commission VI.4. The papers were discussed intensively during the workshop and the general observation was made that the different subjects indeed fitted very well together to generate a general overview of the situation and that the

conclusions of the different experts were in agreement, at least in a qualitative sense. The full text of all contributions, together with introduction and conclusions, will be published in *Pure and Applied Chemistry*.

Uncertainties in sources and sinks

Uptake by oceans

A recent evaluation of the differences in partial CO₂ pressure between atmosphere and upper layers of the ocean, together with ¹³C/¹²C and ¹⁴C/¹²C ratios measured in atmospheric CO₂, has indicated that the uptake of oceans could be lower than formerly accepted.

Dr David Turner discussed the possible reasons for this discrepancy. The uptake of flux (F) of the ocean can be described as:

$$F = \Delta p(\text{CO}_2) \times k$$

where $\Delta p(\text{CO}_2)$ is the difference between the actual and the saturated CO₂ partial pressure in the upper layers of oceans, and

k is piston (or transfer) velocity (a measure of the rate of exchange between sea and atmosphere).

Uncertainties in either piston velocity or $\Delta p(\text{CO}_2)$ would influence the estimates of the uptake by the oceans. The conclusion was reached that the $\Delta p(\text{CO}_2)$ measurements are probably all correct but that a large uncertainty exists in the value obtained by averaging the relatively few measured data.

Another source of uncertainty is the so-called 'piston velocity'. A discrepancy of a factor of two or more exists between piston velocities derived by wind tunnel experiments and inert tracer experiments compared to values based on ¹⁴C measurements. Cosmic radiation (and atomic bomb explosions) generate ¹⁴C. Comparison of the ¹⁴C concentrations in the air and sea gives an estimate

of the average piston velocity.

The general agreement of the participants of the workshop was that the ¹⁴C-based value is probably the best, as wind tunnel and tracer experiments do not take into account all possible chemical and biological interactions which could have a large influence on air/sea interaction. A high piston velocity in combination with adapted average $\Delta p(\text{CO}_2)$ values would lead to higher uptake in the oceans as calculated on the basis of present data on $\Delta p(\text{CO}_2)$ values.

It was generally felt that the uptake by the oceans could vary between 1 and 2.5×10^{15} grams of carbon (g C) per year, with a value of between 1 and 2×10^{15} g C as the most probable range.

CO₂ fertilization flux

The increase of CO₂ in the atmosphere will induce enhanced growth of vegetation and part of the carbon fixed in this way will be present in the form of enlarged root systems. A certain fraction of the extra carbon, present in roots, will remain in the soil after the decay of the vegetation and in this way will be stabilized for periods of between, for example, 50 and 150 years.

Studies of ¹⁴C/¹²C and ¹³C/¹²C ratios, observed in atmospheric CO₂ and carbonate in the oceans, also indicate that a substantial sink must exist, other than the uptake into the oceans. In order to explain the observed isotopic ratios, this sink must at least balance the emissions by deforestation and changes in land use.

Dr Gerd Esser presented a model, based on carbon balances, including the principal carbon pools (phytomass, litter and soil organic carbon) as well as the most important fluxes (net primary productivity, litter production, litter depletion, production of soil organic carbon, depletion of organic carbon and leaching of organic carbon).

This model also has to postulate the existence of a large CO₂ fertilization flux in order to achieve a



The increase of CO₂ in the atmosphere will induce enhanced growth of vegetation.

reasonable balance in the carbon cycle. If the fertilization flux is ignored in this model, a CO_2 concentration as low as 260 p.p.m. has to be assumed for the year 1860 — before large-scale industrialization. Results of the analysis of air bubbles in ice cores suggest a value of 283 p.p.m., with an uncertainty of about 1%, and this value is in excellent agreement with the model results if a CO_2 fertilization flux is taken into account.

The uncertainty in each of the approaches (data on isotopic composition, agricultural research and modelling of carbon pools and fluxes) is quite large, but the fact that all three must assume a CO_2 fertilization flux in order to balance sinks and sources is a very strong argument to accept the existence of such a flux.

Part of this biospheric fixation may be due to global eutrophication. The enhanced availability of nitrogen, phosphorus and sulfur compounds, due to pollution, can act as fertilizers and lead to faster growth rates for vegetation. This mechanism links the problems regarding acidification with those connected to climatic changes.

The value of this flux could vary between 1 and 3×10^{15} g C per year and the most probable range lies between 1 and 2.5×10^{15} g C per year.

CO₂ emissions due to the use of fossil fuels

The estimates of the present emissions of CO_2 , caused by the use of fossil fuels, of about 5.5×10^{15} g C per year, is probably the best characterized part of the CO_2 cycle. The uncertainty in this source could be as little as 10% for the present situation. The uncertainty is very different if one regards predictions for future emissions.

The energy scenarios discussed by Dr Jae Edmonds and speakers from developing countries made clear that the energy demands of these countries in the future introduce a large uncertainty in the future projections of the emissions of CO_2 by the use of fossil fuels. The combined effects of the development of the economic systems of developing countries, which will require a substantially higher energy consumption per head of the population, and the expected increase in population of developing countries could result in a dramatic increase in the use of fossil fuels and hence to higher CO_2 emissions.

The developing countries are aware of the problems relating to increased concentrations of greenhouse gases and in principle are willing to implement reforestation programmes and energy conservation, but economic development and the fight against poverty have higher priorities. A number of countries, for example China, have large reserves of coal which enable energy to be supplied at modest prices.

Compared with oil or natural gas, the CO_2 emissions from burning coal are, respectively, 14%



At present, fossil fuels emit about 5.5×10^{15} g of carbon into the atmosphere each year.

and 72% higher for the production of the same amount of energy. This means that CO_2 emissions could increase drastically in under-developed countries in the near future, especially if coal is used as a main source of energy.

This increase could very well be so large that it would swamp all effects of measures directed to the abatement of CO_2 emissions taken by the developed countries, even in the case that severe limitation of CO_2 emissions are accepted by developed countries.

CO₂ emissions by deforestation and changes of land use

Analysis of the isotopic composition of CO_2 in the atmosphere and carbon balance studies indicate that the biosphere constitutes a net sink. This means that the emission by deforestation and changes of land use must be less than the CO_2 fertilization effect.

It is assumed that the CO_2 flux due to this source, is in the order of $1-2 \times 10^{15}$ g C per year. The total amount of carbon introduced in the atmosphere by deforestation and changes of land use for the period 1860–1980 is probably in the order of 100×10^{15} g.

Conclusions regarding uncertainties in sources and sinks

The following overview of fluxes can be given:

1. Emissions by use of fossil fuel, 5.5×10^{15} g C

per year at present. This is the best characterized flux. The uncertainty is in the order of 5–10%. Future predictions of this flux are difficult in view of the uncertainties in economic development — especially of the developing countries.

2. Emissions by deforestation and changes in land use. This flux is in the order of $1\text{--}2 \times 10^{15}$ g C per year and is less certain compared with emissions from fossil fuels.
3. Uptake in the oceans amounts to a flux of $1\text{--}2.5 \times 10^{15}$ g C per year. This flux is quite uncertain in view of the uncertainties in piston velocities and the averaged value of $\Delta p(\text{CO}_2)$ measurements. The most probable range is between 1 and 2×10^{15} g C per year.
4. Uptake by CO_2 fertilization could range from 1 to 3×10^{15} g C per year. A probable range is $1\text{--}2.5 \times 10^{15}$ g C per year.

Figure 2 shows an overview of sources and sinks.

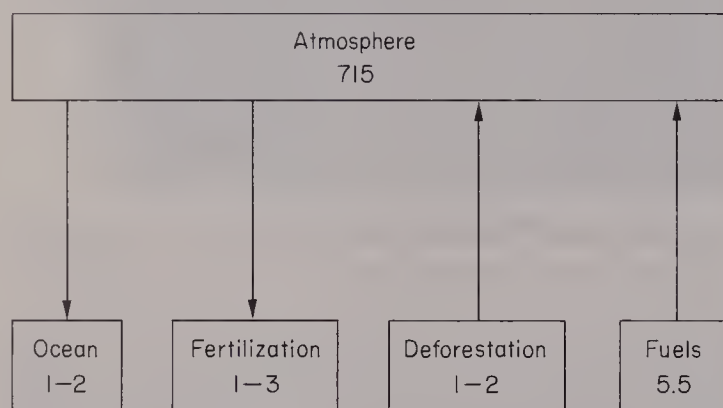


Fig. 2. Overview of the most important fluxes of CO_2 (in 10^{15} g C).

The existence of a large fertilization flux is an important parameter in formulating optimized abatement measures. If we assume a fossil fuel flux of 5.5×10^{15} g C, a flux due to change in land use of 1.5×10^{15} g C, uptake in the ocean amounting to 1.5×10^{15} g C and a fertilization flux of 2.5×10^{15} g C, the difference of 3×10^{15} g C between sinks and sources accounts for the accumulation of CO_2 in the atmosphere.

If we are able to stop the deforestation, the difference between sinks and sources would be in the order of 1.5×10^{15} g C, corresponding to a 27% reduction of the emissions by fossil fuels. Measures directed to stop deforestation and optimizing agricultural production are probably cheaper than reductions in the order of 60% or more of emissions by fossil fuels.

The relatively low agricultural productivity per unit land area of the countries containing the large tropical forests (0.1–0.2 of the potential production per unit of land area, to be compared with 0.6–1.1 for European countries) leaves room for such a policy. A combination of different measures (reduction of the use of fossil fuel, reforestation and optimizing agricultural activities) could be effective

in this case and leave some room for extensions of emissions by the developing countries.

An integrated approach, combining measures in the areas of energy conservation, abatement of emissions by fossil fuels, optimizing agricultural activities and infrastructure and reforestation can offer a solution for the coming decades.

Recommendations for future research

A general problem in the assessment of the trend in atmospheric CO_2 concentrations is the fact that the CO_2 concentration in the atmosphere is the resultant of exchange fluxes between very large reservoirs. The atmosphere contains about 720×10^{15} g C; the biosphere, vegetation plus soil, about 1800×10^{15} g C; and the oceans, including very deep water layers, about $37\,000 \times 10^{15}$ g C.

The present atmospheric CO_2 concentration increase corresponds to a net increase of 3×10^{15} g C per year. Changes in these large carbon pools cannot be monitored directly. So only indirect methods, based on the assessment of the different fluxes, are available.

The uncertainties in the uptake of CO_2 by the oceans can effectively be addressed by combining approaches based on $\Delta p(\text{CO}_2)$ measurements and estimates of piston velocity by direct measurements of fluxes using either labelled CO_2 , gradient measurements or eddy correlation techniques.

Research along these lines has not yet started in the various international programmes but they should receive priority. Existing international programmes will furnish additional data on average $\Delta p(\text{CO}_2)$ values, which are also essential for deriving the CO_2 uptake.

A better estimate of the CO_2 fertilization flux can be reached by extending measurements of CO_2 and its stable isotopes to regions in the continental interiors, assessment of the integrated fluxes of different vegetation systems over long periods of time and mechanical biological research in the accumulation of carbon in vegetation and soils due to the CO_2 fertilization effect.

Good documentation of changes of land use via satellite surveillance, in combination with better knowledge of the effects caused by these changes, and a more extensive series of measurements of ^{14}C and ^{13}C are the only means available to obtain estimates of the CO_2 fluxes caused by deforestation and changes of land use.

Awareness in the developing countries of the problems caused by global pollution and its possible effects is very important. Knowledge of global pollution is an essential factor determining the attitude of the developing countries — not only on the political level but also on the scientific level. IUPAC can and must fulfil an important role in this process, based on IUPAC's good contacts with both developed and under-developed nations.

Strength and toughness in Prague

The 13th Discussion Conference on Mechanisms of Polymer Strength and Toughness took place in Prague, Czechoslovakia from 16 to 19 July 1990. *Chemistry International* editor Michael Freemantle describes some of the highlights of the meeting.

Introduction

As I emerged from Prague Airport, after my flight from London, I saw several people holding up cardboard signs with names on them. On one of these signs was written 'Freemantle' and underneath my name 'Strength and Toughness'. The bearer of this somewhat flattering welcome was Dr Bohumir Valter who is Deputy Chairman of the Prague Meetings on Macromolecules (and also an IUPAC affiliate).

The 'Strength and Toughness' referred, of course, not to me but to the 13th Discussion Conference on Mechanisms of Polymer Strength and Toughness which was held at the Institute of Macromolecular Chemistry of the Czechoslovak Academy of Sciences in Prague from 16 to 19 July last year. This conference was one of a series of Prague Meetings on Molecules.

The 13th Discussion Conference was specifically concerned with mechanical properties of polymers, mainly strength and toughness, in relation to structural mechanisms. As macroscopic strength and toughness reflect several structural levels simultaneously, the scientific programme of the

conference covered processes of various structural scales from molecular fracture and fracture-emission phenomena to fracture mechanics and crack growth kinetics.

The conference, which was attended by 151 participants from 20 countries, included contributions dealing with the early stages of fracture and contemporary methods of monitoring crack initiation and subcritical crack growth.

Other contributions were concerned with practical problems of strength and toughness in real materials and balancing strength and toughness in polymer blends and composites.

The opening ceremony included addresses from the Conference Chairman Dr Miroslav Raab and Dr F. Rypáček who is Deputy Director of the Institute of Macromolecular Chemistry.

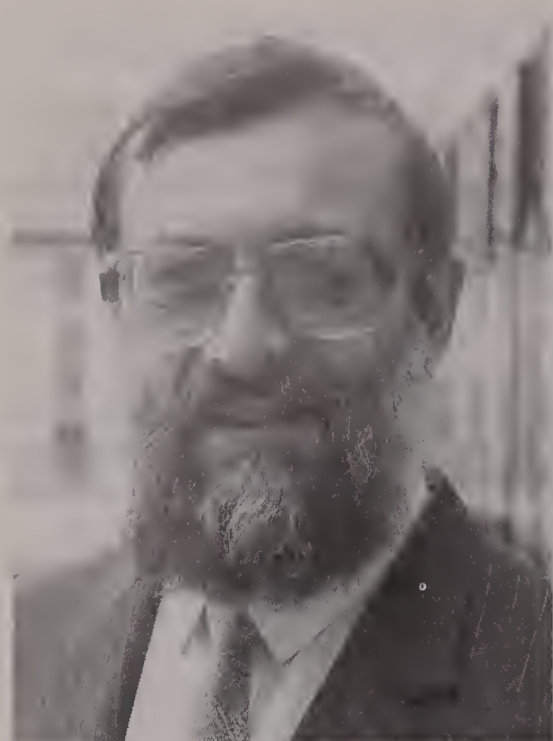
The scientific programme spanned 4 days and consisted of 12 invited main lectures (40 minutes), 13 invited special lectures (20 minutes) and 56 poster contributions. The contributions centred around four major topics.

- Molecular fracture and its role in fracture initiation. Inter-relations between fracture and degradation
- Effects of supermolecular structure, flaws and inclusions on crack initiation and propagation. Fracture processes in filled polymers and short fibre composites. Structural aspects of fracture mechanics.



The Institute of Macromolecular Chemistry (above) in Prague (right) was the venue of the 13th Discussion Conference on Mechanisms of Polymer Strength and Toughness.





Dr Miroslav Raab (left) was Chairman of the 13th Discussion Conference. IUPAC affiliate Dr Bohumir Valter (right) is Deputy Chairman of the Prague Meetings on Macromolecules.

- The role of plasticity in the failure of polymers. Ductile–brittle transition. Cracking, crazing, shear banding and environmental effects.
- Physical meaning of experimental scatter in strength and toughness. Reliability of polymeric materials. Strength and durability predictions.

The full texts of the main and special lectures will be published in a special volume of *Die Makromolekulare Chemie, Macromolecular Symposia*.

Strength and toughness of glassy polymers

Immediately following the opening ceremony, Dr H. H. Kausch (Swiss Federal Institute of Technology, Lausanne) presented a main lecture on 'Molecular mechanisms contributing to the strength and toughness of glassy polymers'.

He pointed out that strength and toughness are perhaps the most important mechanical properties of polymers: they are both influenced by molecular architecture, polymer superstructure, and sample homogeneity. Sample geometry (especially notches), experimental parameters (rate of stress or strain, temperature) and environment can also influence a given, basically ductile material to such an extent as to provoke tough–brittle transitions.

Kausch reminded participants that **strength** is generally defined as the largest stress under which a specimen under given circumstances does *just not* break.

From this it follows that one can increase the strength of a sample by:

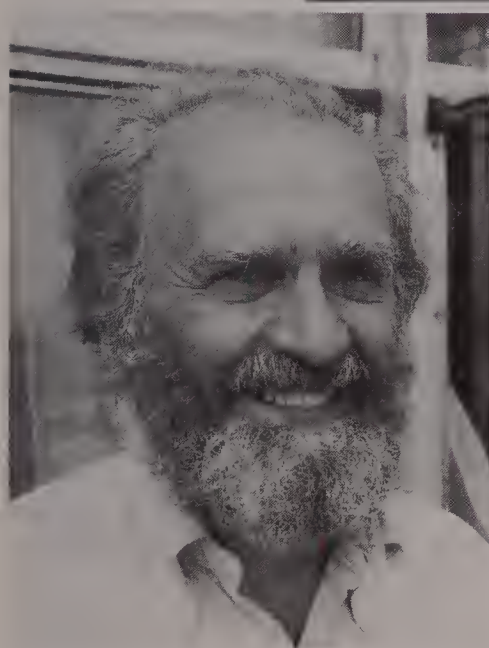
1. increasing the stress necessary to reach the critical deformation by providing more and better oriented primary bonds per cross-section; and
2. retarding as much as possible the inception of fracture or yield by eliminating all defects and

stress concentrators and by hopefully keeping competing mechanisms (crazing) away.

He added that the **toughness** of a material is its capacity to withstand brittle fracture. The form of its stress–strain curve and the surface under it *can* be a measure of this property. But it should be made clear that tough material behaves as such even before it comes to yielding or crack propagation (mostly it does not help very much if each small impact event leaves a stress-whitened zone in a glassy polymer instead of breaking it completely; what one needs is a dispersion of the impact energy even before stress-whitening or fracture will be initiated).



Kausch discussed the stress transfer and load-carrying capability of a single chain and its role in ductile and brittle fracture. The main results are that no more than 5–15% of all molecules within an isotropic specimen (or, more precisely, present around the future plane of fracture) are necessary for efficient stress transfer.



Participants (centre) listen intently to lectures presented at the 13th Discussion Conference. Top left: Professor V. A. Zakrevskii (USSR) — 'Electron emission during deformation of polymers'. Top right: Professor Tom Dickinson (USA) — 'Fractoemission accompanying the failure of interfaces'. Bottom right: Professor Peter Lemstra (The Netherlands) — 'Hybrid composites based on PE/carbon fibres'. Bottom left: Professor Norman Brown (USA) — 'The room temperature ductile-brittle transformation in polyethylenes and the relationship to long time durability'.



Recent crack healing experiments have also revealed the role of entanglements in stress build-up and energy dissipation. Further molecular parameters of importance are the internal and external chain mobility, that is, the capacity of a segment to adjust to increasing forces by spatial rearrangements. Kausch showed the limits of such adaptation using chain scission in rapid flow as an example. At very high strain rates the energy input can be so fast as to let even an isolated coil in highly dilute solution react in an almost brittle manner.

Ductile polymers

Conference Chairman Miroslav Raab (Institute of Macromolecular Chemistry, Prague) and Galina Zamfirova (Institute of Transport Engineering, Sofia, Bulgaria) were the co-authors of a paper on 'Competition between orientation and fracture in ductile polymers' presented as a main lecture at the meeting.

The paper discussed the mechanism of crack propagation in ductile polymers as a competitive and feedback process and, in particular, demons-

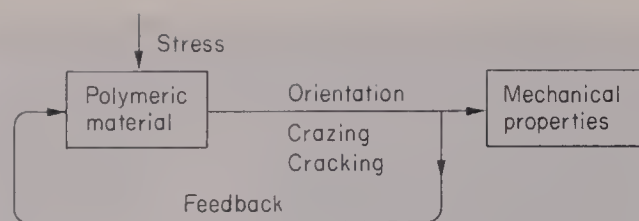


Figure.

trated the effect of artificial cracks on the time to break and strain at break of a low-density polyethylene film.

The 'self-defence' of the material can bring about an anomalous increase of the time to break with increasing stress. Their suggested structural model (see Figure) emphasized the role of orientational strengthening and inherent flaws ahead of the main crack tip. The authors also examined the effect of the photo-oxidative degradation on the mechanical behaviour of polyethylene and polypropylene films and the mechanical equivalence between crack and degradation.



IUPAC affiliate Dr Vincent Gallez (Polymers Group, Exxon Chemical International Inc., Machelen, Belgium) participated at the Prague meeting.

Highly oriented polymers

Professor Georg Hinrichsen (Institute of Non-metallic Materials, Technical University of Berlin) presented a main lecture on 'Deformation and fracture behaviour of highly oriented polymers'.

He pointed out that highly oriented polymers represent one of the main routes of developments of macromolecular materials because of their superior mechanical properties. For example, gel-spun polyethylene, polyaramide, or carbon fibres and films exceed metallic products in regard to tensile strength, elastic modulus, and impact resistance.

Hinrichsen explained that mechanical properties of highly oriented polymers are influenced by many parameters, like temperature, deformation rate, molecular weight (distribution), superstructure, crystallinity, and molecular orientation within the crystalline and amorphous regions.

In the second part of his lecture, he dealt with peculiarities of the deformation behaviour of oriented poly(ethylene terephthalate) and poly(propylene) films as revealed by small angle X-ray scattering (SAXS) in combination with X-ray wide angle, DSC, density, birefringence, and IR investigations.

The superstructure of oriented semi-crystalline specimens is characterized by a layer arrangement of alternating crystalline and amorphous regions. Both thermal and mechanical treatments were applied to the films, and from the SAXS curves the mean square density fluctuation of the phases in dependence on applied stress and temperature was obtained. The deformation led to an increase of orientation of chain segments within the amorphous inter-layers; to a decrease of density of the amorphous regions, and to a formation and growth of microvoid volume.

Polymer alloys

In a lecture entitled 'Crazing and shear deformation of polymer alloys' Professor I. Narisawa (Yamagata University, Japan) stated that there are two typical energy absorbing mechanisms in polymer alloy systems. Massive crazing plays an important role for polystyrene-based polymer alloys, but shear deformation is a dominant energy-absorbing mechanism for other alloy systems.

Narisawa described the results of numerical simulation which has been carried out to make clear the processes of initiation and growth of a craze or shear deformation around the particles. He then proposed a new model which characterizes the mechanical properties in order to calculate the stress state around the craze.

Narisawa next discussed the stability of craze growth on the basis of the stress state at the tip of a growing craze. He pointed out that the effects of elastic modulus and Poisson's ratio on the growth of shear deformation around the particles have been examined in detail. He proposed the necking model between particles to explain a critical ligament thickness which gives brittle-ductile transition in multi-phase polymer alloys.

Brittle-ductile transitions in polycarbonates

Professor T. Ricco (Universita degli Studi de Trento, Italy) presented a 20-minute special lecture on 'Characterization of brittle-ductile transitions in polycarbonate at different molecular weights'.

He informed the conference that polycarbonate is known to exhibit brittle-ductile transitions in the fracture behaviour with varying 'external' conditions like temperature and strain rate, as well as the state of stress as determined by testing configuration and the sample geometry and size, such as thickness and notch tip radius.



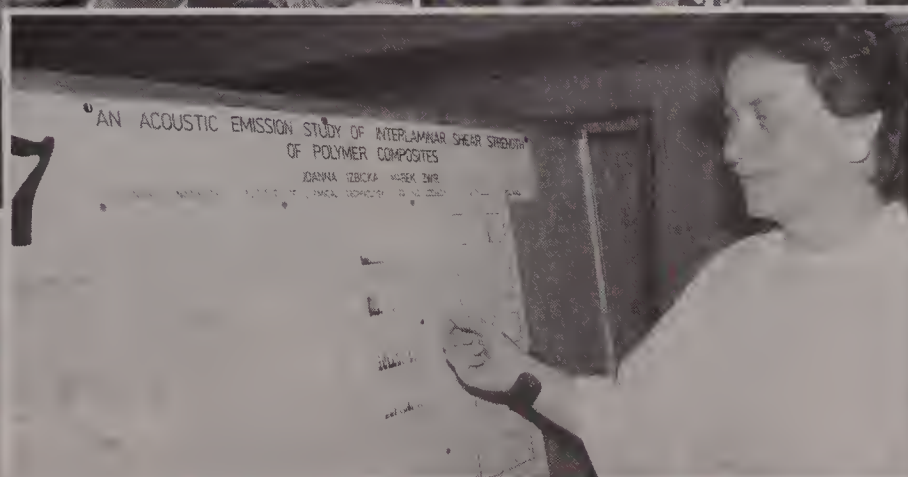
Participants at the 13th Discussion Conference in Prague.

Furthermore, these transitions have been shown to be affected by 'internal variables' like molecular weight and the volumetric state of the material induced by annealing processes and physical ageing.

From a macroscopic point of view the nature of brittle-ductile transitions can be envisaged in the transition from prevailing plane strain to prevailing plane stress fracture, whereas in terms of deformation mechanisms it can be ascribed to the transition from craze to shear yielding controlled fracture.

Ricco reported that he has characterized the brittle-ductile transition in polycarbonate with varying temperature, strain rate and notch tip radius in three-point bending tests. From the results the correlations among transition temperature, notch tip radius and strain rate were found and the fracture behaviour of the material mapped as a function of the considered variables. Ricco has also investigated the influence of molecular weight on correlations among temperature, strain rate and notch tip radius at the brittle-ductile transition.

Poster sessions



The conference include two poster sessions with a total of 56 posters on display. They included a poster by Dr Joanna Izbička (centre) and colleague Dr Marek Żwir (Institute of Chemical Technology, Technical University of Szczecin, Poland) on 'An acoustic emission study of interlaminar shear strength of polymer composites'.

Dr Martin Buggy (top left-left) and Dr Colin Birkinshaw (top left-right) from the University of Limerick, Ireland, displayed a poster on 'Fracture of irradiated polymers'.

Chemical Research Applied to World Needs

When the CHEMRAWN Committee met in Warsaw in May last year, it considered arrangements and plans for forthcoming conferences on 'Chemistry and the Atmosphere' (CHEMRAWN VII); 'Chemistry and World Food Supplies'; and 'Waste as a Raw Material for Industry'.

The CHEMRAWN conferences are a series of IUPAC-sponsored conferences devoted to CHEMical Research Applied to World Needs. In May last year, the CHEMRAWN committee met in Warsaw, Poland to discuss future CHEMRAWN conferences and other IUPAC activities related to CHEMRAWN.

The Chairman, John Thomas (UK), opened the meeting by welcoming those present and thanking Edward Grzywa (Poland) for his kind hospitality and efforts in making arrangements for this meeting in Warsaw. He then summarized progress on the book *Perspectives in catalysis* of which he was joint editor with Kirill Zamaraev (USSR). The book would be the second volume in the IUPAC *Chemistry in the 21st century* series.

Michael Freemantle (IUPAC) circulated copies of the recently published booklet *Chemistry and the environment*. He explained that this publication was the first step in IUPAC's new mission-oriented programme on chemistry and the environment. The booklet contains summaries of all recent and ongoing IUPAC projects related to the environment. Freemantle drew attention to the chapter on CHEMRAWN and related activities.

Chemistry and World Food Supplies

Professor 'Rajan' Varadarajan reported on progress on arrangements for the 2nd CHEMRAWN Conference on Chemistry and World Food Supplies. The original plan was to hold the conference in India. The Indian Council of Agricultural Research had agreed to support the meeting. However, due to changes in the government there were now some difficulties in the arrangements. Varadarajan suggested that since there were more serious food

problems in some African and Asian countries it might be more appropriate to hold the conference in Africa or Asia.

Cyril Ponnampерuma (Sri Lanka), who is Chairman of the Future Actions Committee of CHEMRAWN II (Manila, Philippines, 1982) thought that it might be appropriate to concentrate on the African problem and hold the conference in 1992, that is, 10 years after CHEMRAWN II.

Ponnampерuma referred to the CHEMRAWN II workshops and pointed out that a workshop in West Africa was planned for 1992. The venue would be the Institute of Tropical Agriculture (ITA), Ibadan, Nigeria. The committee agreed that it would be suitable to convert the workshop to a full-blown CHEMRAWN conference. Ponnampерuma proposed that Nyle Brady (UNDP) should be involved in the arrangements.

Members of the committee suggested various themes for the conference. In particular, the conference should look back over the past 10 years to CHEMRAWN II and also look forward. Alan Hayes (UK) stressed the need to examine the balance between intensive agriculture (using agrochemicals) and extensive agriculture (using more land). Both forms have an impact on the environment. Varadarajan thought impact of biotechnology should be considered.

It was agreed that, *pro tempore*, Ponnampерuma should follow up these proposals for a conference in Ibadan. Jean-Baptiste Donnet (France) and Grzywa agreed to consult the Committee on Chemistry and Industry (COCI). A subcommittee consisting of Adzei Bekoe (Kenya), Ponnampерuma, Varadarajan, and Hayes would form the nucleus in order to produce a brief document for the next CHEMRAWN committee meeting. The document would outline arrangements for the conference.

Waste as a Raw Material for Industry

Copies of a letter and proposal from Professors Koptug and Nefedov (USSR) to Thomas concerning a proposed CHEMRAWN Conference on 'Chemical Aspects of Environmental Problems of Industry and Transportation — current state and perspectives' were circulated at the meeting. Grzywa explained that the proposal incorporated his original proposal for a CHEMRAWN conference on 'Waste as a Raw Material for Industry'.



The CHEMRAWN Committee meeting in Warsaw.



'Rajan' Varadarajan (left), Edward Grzywa (centre) and Adzei Bekoe (right).

Fedor Kuznetsov (USSR) explained that the proposal was to hold the conference in 1992. The plan was to convene the plenary sessions in Moscow and then split the meeting up into several different venues throughout the USSR. Thomas questioned whether these arrangements were practical. Hayes thought the proposal was too broad in its scope. There was also insufficient emphasis on the re-use of industrial waste.

The committee agreed that CHEMRAWN VIII should focus on 'Waste as a Raw Material' and that the conference should be held late in 1993. Various members of the committee agreed to consult representative national bodies about specific themes detailed in the proposal from Koptug and Nefedov.

Grzywa and Kuznetsov agreed to consult Koptug and present a refined proposal for CHEMRAWN VIII at the next CHEMRAWN Committee meeting.

Chemistry of the Atmosphere — Its Impact on Global Change

Rudy Pariser (USA) presented a status report on arrangements for the CHEMRAWN VII Conference on 'Chemistry of the Atmosphere — Its Impact on Global Change', which will be held in Baltimore, USA, 2–6 December 1991. The report included preliminary suggestions for speakers, chairpersons and rapporteurs.

Ponnamperuma felt that scientists from the Third World were not adequately represented on the lists of contributors. He offered to prepare a list of prominent Third World scientists who might be prepared to contribute to the conference. He also suggested that the Third World Academy of Sciences (TWAS) might be able to help and indicated possible sources of funds to help Third World scientists attend the meeting. There was general agreement that the list of contributors was



Following the CHEMRAWN Committee meeting in Warsaw some members of the committee visited Cracow (above). Their itinerary included a descent into the depths of the nearby Wieliczka Salt Mine (right).



unbalanced from a regional point of view. More European and African contributors were needed.

Pariser invited members of the committee to put forward names and addresses of key contributors in respect of (a) the Programme Committee, (b) Future Actions Committee, and (c) scientific programme (speakers, chairpersons, rapporteurs). A number of names were put forward at the meeting.

Chemical education

Donnet reported on a proposal emanating from Professors Gardner (USA) and Kornhauser (Yugoslavia) and the IUPAC Committee on Teaching of Chemistry (CTC) for a CHEMRAWN Conference on Chemical Education. The conference might

embrace media aspects and the public understanding of chemical research applied to world needs.

The committee was not sure whether such a conference fell within the terms of reference of CHEMRAWN. The Chairman agreed to write to the president of IUPAC for guidance on this matter.

Electronic materials

Kuznetsov presented an outline proposal for a CHEMRAWN conference on electronic materials. This would be a follow-up to the CHEMRAWN VI Conference on Advanced Materials held in Tokyo in 1987. The committee invited Kuznetsov to present more detailed proposals at the next committee meeting.

How to suffix your sulfates

This report by the IUPAC Commission on Nomenclature of Inorganic Chemistry offers further guidance on how to name ions and ligands and reviews progress on ongoing CNIC projects. The report is based on the commission's *Newsletter 1990*.

Nomenclature can occasionally be confusing, especially when different authors use different terms for the same compounds. It is particularly annoying when an author uses two different nomenclatures in the same paper.

CNIC has, as its ultimate task, to devise recommendations for the chemical community, according to which chemical structures can be unambiguously and uniquely converted to names and *vice versa*. One of the reasons for the publication of the biennial nomenclature newsletters by CNIC is to raise issues and to help avoid misunderstandings about inorganic nomenclature, with the hope of contributing to better understanding and communication.

The new Red Book

After a 12-year period of preparation and consultation with experts in several subdisciplines, the 3rd edition of the so-called new Red Book (*Nomenclature of inorganic chemistry: Recommendations 1990*) appeared early in 1990 (see *CI*, Vol. 12, No. 5, pp. 172–6, 1990). It is available both in hard cover and in a cheaper soft cover. Summaries of the several chapters were published in the previous newsletter (1987).

Nomenclature of polyanions

In the previous newsletter it was announced that a document on polyanions was in press. This document has now been published (*PAC*, Vol. 59, 1529–48, 1988). It describes how systematic names can be derived for the great variety of polynuclear

molybdates and tungstates, and many derivatives. Even structural information can be derived from the names for these anions.

Periodic Table

The new Red Book contains three different Periodic Tables, that is, with eight columns, 18 columns and 32 columns. When the 18 column table is used, CNIC now recommends that authors should number the columns 1 to 18 in scientific communications.

Names of certain neutral and anionic ligands

About 20 years ago it was decided that negative ligands should have names ending in *-o*, like chloro, bromo, imidazolato, oxo, hydroxo, superoxido, and do on. Only certain organic radicals such as anionic ligands may remain unchanged, for example, methyl and phenyl. Small neutral molecules have names like aqua (H_2O) and NOT aquo. The name for ligated ammonium (NH_3) has two 'm's (ammine), while coordinated organic amines are spelled with a single 'm', for example, methylamine. Bound carbon monoxide is carbonyl (CO). Neutral ligands without special names keep their names unchanged, but are used in enclosing brackets when coordinated, for example, (dinitrogen), (dihydrogen), and (methanol).

Trivial names for certain ions

For a very long time, Fe^{2+} , Fe^{3+} , Cu^+ and Cu^{2+} have been named ferrous, ferric, cuprous, and cupric, respectively. However, because Fe(IV) and Cu(III) have also been found in many compounds, CNIC

suggests the use of iron(II), Fe(II); iron (III), Fe(III); copper(I), Cu(I); copper (II), Cu(II) and so on.

Use of -ate and -and suffixes

Users in the field have been designing ligand group names, such as cheland, cryptand, podand, coronand, sepulchrand, for example, to describe certain chelating ligands. These originate from the words 'ligand' and 'chelate'. In addition, the resulting metal complexes have been indicated as chelates, cryptates, podates, coronates and sepulchrates. Users of these terminologies should realize that these names do not necessarily suggest a negative charge of the complexes (for example: tetrachloroferrate(II) for FeCl_4^{2-}). Furthermore, the term 'ligate' is only to be used as a verb, and not as a noun.

It has been observed that the terms 'liganding' and 'liganded' have appeared in the literature. These words have no linguistic status and the correct terms are 'coordinating' (or ligating) and 'coordinated' (or ligated), respectively.

Charge of cations and anions

It is now generally agreed to use only the format: Al^{3+} , SO_4^{2-} , Mn^{2+} for example and NOT Al^{+++} , SO_4^{-2} , Mn^{+2} , S^{--} , $\text{S}^=$ and so on. In case of radical ions one should register the radical dot first, followed by the charge, for example $\text{O}_2^{\cdot-}$.

Ligand abbreviations

It would be a great advantage in communication if all chemists and journal editors would use the same abbreviations to describe ligands. As a first step towards this situation, the new Red Book contains a list of about 90 recommended abbreviations for common and frequently used ligands. It is hoped



Stanley Kirschner invites readers to write to him about ligand abbreviations. His address is: Department of Chemistry, Wayne State University, Detroit, Michigan, USA.

that inorganic chemists and journals will soon use these abbreviations throughout.

Guidelines for composing abbreviations are also to be found in the new Red Book, one of them being that all papers using ligand abbreviations should explain these at least once in the text.

Eventually, the list mentioned in the Red Book will be extended, based on interactions with scientists in the field. Prof. Stanley Kirschner is collecting new items and readers are invited to write to him about this matter. It is intended that future ligand abbreviations should also contain indications for situations where a (non-acidic) hydrogen has been lost, and to indicate the donor atom(s) in the coordinated ligand.

Square brackets

Coordination entities are to be placed between square brackets, as in $[\text{Ni}(\text{H}_2\text{O})_6](\text{ClO}_4)_2$; note that the ClO_4^- anion and other common oxo anions can be considered a coordination anion, but common practice allows either no enclosing marks, like in $[\text{Ag}(\text{NH}_3)_2]\text{NO}_3$, or parentheses where a subscript is needed.

Recently published documents of interest to inorganic chemists

The Commission on Physical Organic Chemistry has recently published a document (PAC, Vol. 60, 118–19, 1988) on the use of names for hydrogen isotopes, as neutral species and as ions. A consequence of this use is that H^+ is to be named as a proton only when ^1H is meant (like in proton NMR). The names for ^2H and ^3H are deuteron and triton respectively. In cases where the isotope mixture is meant, one should use 'hydron'.

This usage has been taken up throughout the new Red Book and is part of the systemization of nomenclature. Although many chemists will find this nomenclature awkward, students learning chemistry may find it easier, more systematic and less confusing.

Ongoing activities

CNIC is currently working on several topics of more specialized nomenclature, for inclusion in the so-called Red Book, Part II.

Topics expected to be included are (with references to PAC):

1. *Nomenclature of polyanions* (Vol. 59, 1529–48, 1988)
2. *Nomenclature of nitrogen hydrides* (Vol. 54, 2545–52, 1982)
3. *Nomenclature of isotopically labelled compounds* (Vol. 53, 1887–900, 1981)
4. *Graphite intercalation compounds* (Vol. 51, 1561–71, 1979)
5. *Inorganic polymeric compounds* (Vol. 57, 149–68, 1985)
6. *Inorganic rings and chains* (in preparation).

How to contact CNIC

In case of other nomenclature matters, readers are welcome to contact any CNIC member:

- CNIC Chairman: Prof. A. M. Sargeson, Research School of Chemistry, Australian National University, GPO Box 4, Canberra, ACT 2601, Australia.
- CNIC Secretary: Prof. R. S. Laitinen, Department of Chemistry, University of Oulu, Linnanmaa, SF-90570 Oulu, Finland.
- Prof. D. Coucouvanis, Department of Chemistry, University of Michigan, Ann Arbor, Michigan 48109, USA.
- Prof. J. A. McCleverty, School of Chemistry, University of Birmingham, PO Box 363, Birmingham B15 2TT, UK.
- Dr M. W. G. De Bolster, Vakgroep Organische en Anorganische Chemie, Faculteit der Scheikunde, Vrije Universiteit, De Boelelaan 1083, 1081 HV Amsterdam, The Netherlands.
- Mr T. E. Sloan, Chemical Abstracts Service, Department 64, PO Box 3012, 2540 Olentangy River Road, Columbus, Ohio 43210, USA.
- Prof. K. Wieghardt, Institut für Anorganische Chemie I, Ruhr-Universität, Postfach 102148, D-4630 Bochum, FRG.

Commission & Committee News

Photochemistry

The Commission on Photochemistry met twice during working lunches at the 13th IUPAC International Symposium on Photochemistry held in Warwick, UK, 23–27 July 1990. Several commission projects were reviewed at the meetings.

The 'Fluorescence decay project' was completed in the time since the previous commission meeting, finalized and approved by the Organic Chemistry Division. It was published as 'Recommended methods for fluorescence decay analysis' in *PAC* (Vol. 62, No. 8, pp. 1631–48, 1990). The commission invites comments from photochemists on this document.

Drs Bonneau and Hug presented the latest version of the 'Extinction coefficients of transients project' to the commission. The content, style and form were judged to be excellent. The commission voted in favour of presenting the completed document to the Organic Chemistry Division for approval and eventual publication in *PAC*.

During the time since the Lund General Assembly, the Commission Secretary Dr Eaton put the document on the 'Radical ions project' into a final form for forwarding to the division for approval for publication in *PAC*. Professor Iwamura reviewed the changes and offered minor corrections which were made. A final review of the document will be requested from Professor Bally (an early member of the working party) before final publication.

Professor Verhoeven presented a new version of 'Terms on electron transfer' to be prepared as an expansion to the now published commission document 'Glossary of terms used in photochemistry' (*PAC*, Vol. 60, No. 7, pp. 1055–106, 1988). There was a discussion of the specific technical terms to be included in the next version. Verhoeven

will prepare a new version for circulation to a panel of outside experts, as a working party, for comment. It is expected that comments from this group will produce a version ready for commission approval.

Education project

This broad project on education aims to develop, print and distribute educational information in experimental photochemistry. Begun by Professor Tokumaru (who completed his term on the commission in 1989), the project is now coordinated by Dr Coyle. In Warwick, he presented a huge volume of collected experiments, provided by photochemists around the world.

There was extensive discussion of what the overall goal of the project was, to what use the document would be put and how much physical support (teacher time, equipment and so on) is needed to use effectively some of the experiments so far collected. Dr Coyle believes the current document is too large and needs critical selection.

It was decided to divide the project into two stages: the first stage would select a reduced, simple set of experiments which could be used with a minimum of resources. This stage would be completed first, and the commission would seek assistance from the IUPAC Commission on Teaching of Chemistry (CTC) to publish it and distribute it widely.

The second stage, to be completed at a later date, would be a more comprehensive set of both the simple and some more complex experiments. The commission considers it feasible to explore commercial printing and distribution of this document.

After extensive discussion, the 10–12 experiments to be included in the first stage of the project

were selected. Commission members are requested to make specific comments on any of these experiments to Coyle, who will then provide a working document by 1 March 1991 for distribution to the commission for extensive comments before the Hamburg General Assembly. All remaining experiments will be retained and worked on at a later date in the second stage of the project.

Commission Chairperson Professor Silvia Braslasky received a request for a glossary of terms used in photocatalysis and in photochemical work with polarized light. She will send letters to experts in these areas soliciting ideas and comments on the need for this effort.

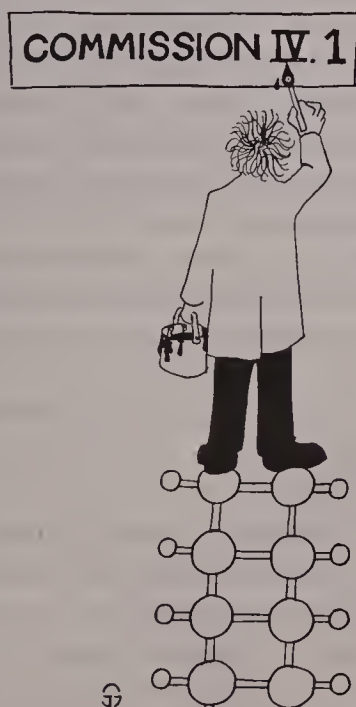
Professor De Schryver reported on the status of a non-IUPAC project to collect and document reference compounds for use in fluorescence decay analysis and calibration of instrumentation. Drs Ameloot and Boens have nearly completed analysis of the results of studies in laboratories of experts in the field. De Schryver promised to keep the commission informed of results on this project.

Chemists are invited to comment on any aspect of the commission's activities, or to suggest new topics as projects. Please contact the Commission Secretary, David F. Eaton, The Du Pont Company, Central Research and Development Department, Experimental Station, PO Box 80328, Wilmington, Delaware 19880-0328, USA.

David F. Eaton

Ladder polymer nomenclature

The Commission on Macromolecular Nomenclature (IV.1) met in Montreal, Canada in July 1990 in conjunction with the 33rd IUPAC International Symposium on Macromolecules.



Following favourable comments from many experts on a draft version of the document 'Nomenclature of regular double-strand (ladder and spiro) organic polymers', the commission decided

that the document is ready for review by the Interdivisional Committee on Nomenclature and Symbols (IDCNS).

Regular, double-strand organic polymers, previously named by rules developed by *Chemical Abstracts*, upon which this document is based, are polymers whose macromolecules are formed by an uninterrupted sequence of rings with adjacent rings having one (spiro polymer) or two or more (ladder polymer) atoms in common and having only one species of constitutional unit in a single sequential arrangement.

Rules provided for breaking the rings to identify the preferred constitutional repeated unit (usually a tetravalent group), for orienting the constitutional repeated unit properly to allow assignment of locants, and for naming the constitutional repeating unit, allow one to assign unambiguous structure-based names to the polymer. Many examples accompany the rules to illustrate their application to known ladder and spiro polymers.

Three documents nearing completion

Three other documents are approaching completion and will be sent to selected groups of experts for review following revisions at the Montreal meeting.

Comments received on the first of these, 'Basic classification and definition of polymerization reactions', which defines and clarifies the terminology used to describe the most common polymerization reactions, resulted in decisions to make significant changes to the document.

An example of a radical chain reaction forming a polymer by a polyaddition reaction involving species of all degrees of polymerization, prompted a change in the definition for 'chain polymerization' to require reactive site regeneration on the same polymer backbone after each polymerization growth step.

Reaffirmed, despite some opposition from those consulted, was the decision to use 'condensative chain polymerization' to describe chain polymerizations producing a small molecule by-product. Consideration was given to either eliminating this term or substituting the suggested alternatives 'chain polycondensation' or 'eliminative chain polymerization' for it. However, these were not thought to offer any advantage over the proposed term.

The second document nearing completion, 'Structure-based nomenclature for irregular single-strand organic polymers', provides rules to assign names to irregular polymers, that is, those consisting of more than one species of constitutional repeating unit in a single sequential arrangement. Developed to name polymers with structural irregularities such as those obtained by chemical modification of polymers (for example,

chlorination of polyethylene) or those obtained when polymerization does not cleanly produce one sequential arrangement of constitutional units (for example, head-to-head polymerization defects in a backbone consisting mostly of head-to-tail addition), the nomenclature is also useful for assigning structure-based names to copolymers. If expert opinion identifies only minor changes in this document, it may also be sent to IDCNS for review prior to the commission's 1991 meeting in Hamburg.

'Graphic representation of polymer structures', the final document ready for expert comment, provides systematic rules for drawing recognizable structures for both simple and complicated macromolecules without requiring a substantial written description to clarify the details of the structure. The procedure developed eliminates problems where, owing to the complex nature of polymer molecules constituted of mixtures of repeating units or with unusual structural features, structures drawn in the literature could represent the actual molecule poorly.

Liquid crystals

As planned in 1989, a draft of a document that defines terms used to describe types, morphologies, textures and properties of both low-molar-mass liquid crystals and polymer liquid crystals was presented to the commission this year. Because the commission focuses on macromolecules, it seeks collaboration with authorities in low-molar-mass liquid crystals to aid this project.

Three recently initiated projects, with goals to define basic terminology used in polymer science (a revision of the commission's 1974 document), to define terminology used to describe ageing and degradation processes in polymers, and to update

the rules for nomenclature in regular single strand polymers (a revision of the commission's 1976 document), either had their scope determined or first drafts presented to the commission in Montreal.

Publication of the *Compendium of macromolecular nomenclature* the 'Purple Book', is likely to take place during the first quarter of 1991. The book will provide a single source of information on IUPAC-approved nomenclature and terminology related to polymers.

Finally, the commission decided to stop work, at least for a few years, on the definition of terms related to chiral monomer polymerization and reactions leading to optically active polymers. The field is thought to be growing rapidly and uncertainty exists among experts about the terms that best describe the important features of the reactions. These circumstances make it impossible to reach a consensus on the proposed terminology at this time.

William J. Work

Solubility database

The Commission on Solubility Data (V.8) held its annual meeting at the Rensselaer Polytechnic Institute, Troy, New York, USA on 30–31 July 1990 just prior to the 4th International Symposium on Solubility Phenomena (ISSP). Over 40 members attended the meeting.

Topics of interest included tentative approval of an increase in pricing for the Solubility Data Project (SDP) volumes, the acceptance of a proposed format and software for assembling a trial automated database, preliminary planning of the 5th ISSP meeting in Moscow in July–August 1992, and the designation of new volumes for publication in 1991. Three are already with the publisher for publication in 1990. Some difficulties with volume production were clarified, and a new method for announcing titles for the forthcoming years has been proposed and tentatively approved by the publisher, Pergamon Press.

One cooperative project with the Commission on Atmospheric Chemistry (VI.4) is in the discussion stage and every effort is being made to bring it to fruition.

Lewis H. Gevantman

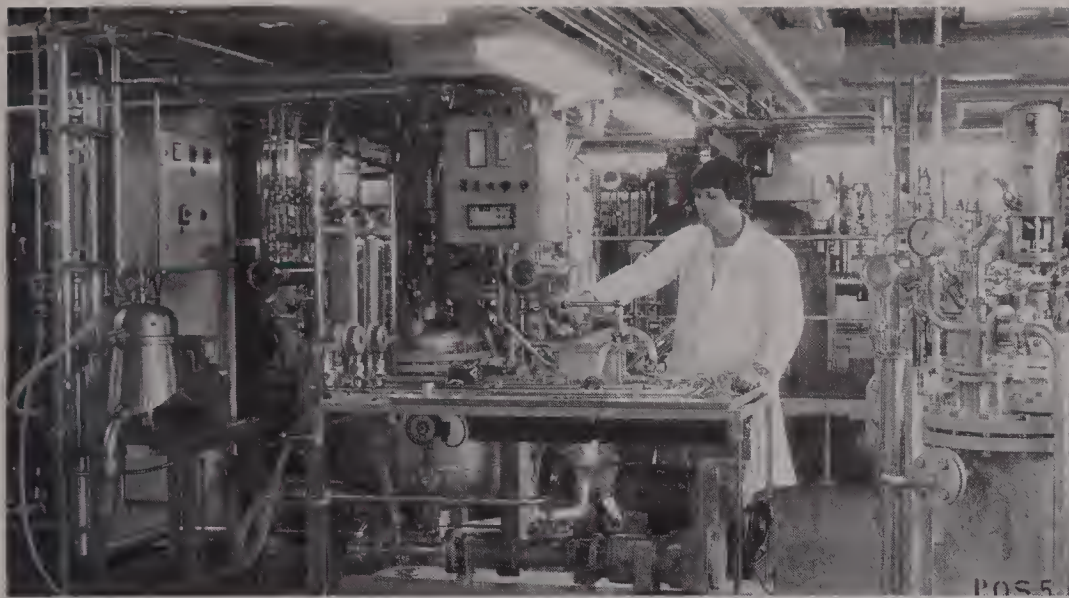
Biotechnology

When the Commission on Biotechnology (VI.1) met in Strasbourg, France in August 1990, it welcomed two new titular members: Prof. A. M. Boronin (USSR) and Prof. Y. Yamada (Japan).

The commission reviewed progress on projects and feasibility studies. It also completed revisions of its *Glossary of terms used in biotechnology*. An announcement of the glossary and a request for critical reviews by colleagues appeared in *CI*. Minor

13:25 KL 621	ATLANTA
13:30 KL 121	LONDON HEATHROW
13:35 AF 913	PARIS DE GAULLE
14:00 GA 897	JAKARTA PARIS
14:05 KL 501	ATHENE
14:45 SA 253	JOHANNESBURG FRANKFURT
14:50 CP 045	VANCOUVER CALGARY
15:00 CP 051	TORONTO
15:15 KL 583	LOME LAGOS
16:00 KL 127	LONDON HEATHROW
16:35 PK 709	LONDON HEATHROW
16:45 JL 420	OSAKA ANCHORAGE

Liquid crystal display at Schipol Airport, Amsterdam. Commission IV.1 is seeking collaboration with authorities in low-molar-mass liquid crystals to help with its project on the terminology of liquid crystals. (Photo courtesy Roche.)



At its meeting in Strasbourg, the Commission on Biotechnology considered protein engineering nomenclature and risks associated with biotechnology. (Photo courtesy Roche.)

changes will be made following suggestions received before February 1991, at which point the glossary will be published in *PAC*,

As outgrowths of this project, the commission will review and update the glossary after a period of about 2 years and will add a list of commonly used abbreviations in biotechnology. It is anticipated that both the glossary and the list of abbreviations will be of considerable use to chemists seeking to communicate and understand the interdisciplinary areas of biotechnology and molecular biology.

Another project that has moved forward with effectiveness is the one concerned with 'Inter-relationships between organic chemistry and biotechnology'. The commission built upon its symposium held at the Boston General Assembly by publishing a series of articles in *PAC*. The authors have received numerous requests for reprints and a continuing series of articles is planned.

One feasibility study was considered to be particularly timely and important and will be raised to the level of a project. It concerns the nomenclature of engineered proteins. Despite extensive activity in this area in the last decade, no unifying recommendations of nomenclature have yet appeared. Efforts will be made to interface with other appropriate bodies within and outside IUPAC and recommendations will be formulated, if possible before the Hamburg General Assembly.

The commission heard a presentation by Dr Pascale Bauda of the Centre de Sciences de l'Environnement in France about the development of a standard method for assessing risks associated with the release of engineered micro-organisms to the environment. It was decided to follow the excellent efforts of this group to confront a difficult and controversial subject in a careful and logical manner with the intention of providing the biotechnological community with recommendations at some point in the future.

A joint project with the European Federation of Biotechnology has been initiated on the subject of 'Downstream processing'. Joint revision of a

published document will be undertaken by these two bodies.

A major new direction of the commission coincides with new efforts of the Union in general. The commission will address issues related to biotechnology and the environment. One aspect of this new direction is the proposal to organize an open meeting at the next general assembly and in the future a symposium for a wider audience.

As part of its ongoing efforts to collaborate with other bodies within IUPAC, the commission held a joint meeting with representatives of the Section on Medicinal Chemistry. Subjects of common interest were identified and plans made for joint projects.

Lila M. Gierasch

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of all commission and committee chairpersons and secretaries and IUPAC officers were published in the November 1989 issue of *C/* (Vol. 11, No. 6, pp. 225–235). The IUPAC Secretariat has been notified of the following additions and changes:

Prof. Y. Jeannin (President). Tel: +33 (1) 44 27 30 34. Fax: +33 (1) 44 27 38 41.

Prof. J. A. McCleverty (Vice-Chairman, Commission on Nomenclature of Inorganic Chemistry). School of Chemistry, University of Bristol, Bristol BS8 1TS, UK. Tel: +44 (272) 303030. Fax +44 (272) 251295.

Prof. P. Müller (Chairman, Commission on Physical Organic Chemistry). Tel +41 (22) 70 26 527.

Dr H. Oleson (Chairman, Commission on Quantities of Unit of the Clinical Chemistry Division). Tel: +45 35 37 43 11/7687 on signal. Fax: +45 31 39 27 45.

Prof. G. M. Schneider (President, Physical Chemistry Division). Fax: +49 (234) 7005539.

Dr D. G. Westmoreland (Secretary, Commission on Microchemical Techniques and Trace Analysis). Fax: +1 (215) 283 2752.

Dr D. Wyrsh (Chairman, Committee on Chemistry and Industry). Fax: +41 (61) 696 69 88.

Pure and Applied Chemistry (PAC) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Soot formation

There are essentially two current mechanisms proposed for soot formation in flames. The more generally accepted mechanism involves neutral free radicals. The other mechanism involves ions and has been championed by IUPAC affiliate H. F. Calcote and his associates at AeroChem Research Laboratories, Princeton, New Jersey, USA.

increasingly larger ions which either become incipient charged soot particles or combine with electrons (produced in the chemi-ionization step) to produce incipient neutral soot particles (see Figure).

A comparison of the rates of total ion formation with the rates of soot formation demonstrates that the rate of ion formation exceeds the rate of soot formation, and that the rate at which ions disappear is approximately equal to the rate at which soot is formed. In addition, ions are observed to disappear at the same point in the flame at which soot is observed to form.

The paper compares the time taken to add 10 carbon atoms, i.e. to grow from C_{10} to C_{20} species, for the neutral and ionic mechanisms. These times, using experimentally measured species concentrations and typical rate coefficients, are comparable for the two mechanisms. The higher concentrations of neutral species are balanced by the greater reaction rate coefficients for ion–molecule reactions, and by the lower number of steps involved in adding a specific number of carbon atoms for the ionic mechanism than for the neutral mechanism.

Other plenary lectures from the Alma-Ata seminar published in this issue of *PAC* are: The mathematical modelling of premixed turbulent combustion (D. Dradley and A. K. C. Lau, UK); A critical review of solid rocket propellant transient flame models (L. de Luca, Italy); Flame structure studies: past, present and future (R. M. Fristrom, USA); Metals vapour oxidation in diffusion flames (O. E. Kashireninov, USSR); Structural aspects of the flame propagation theory (A. G. Merzhanov, USSR); Numerical simulation of flames: current status and future perspectives (E. S. Oran, USA); Thermal structure of solid flames (A. A. Zenin, USSR).

Electrochemistry of metalloproteins

According to H. Allen O. Hill (Oxford, UK), there is now little difficulty obtaining the direct electrochemistry of metalloproteins, whether at modified electrodes, with additional metal ions in solution or even at normal electrode surfaces.

Recently, Hill's group at Oxford has examined the electrochemistry at microelectrodes, whether deliberately designed electrodes or those adventitious in size. From the electrochemistry of protein-protein complexes it appears that mobile, dynamic structures are more compatible with those determined in solution.

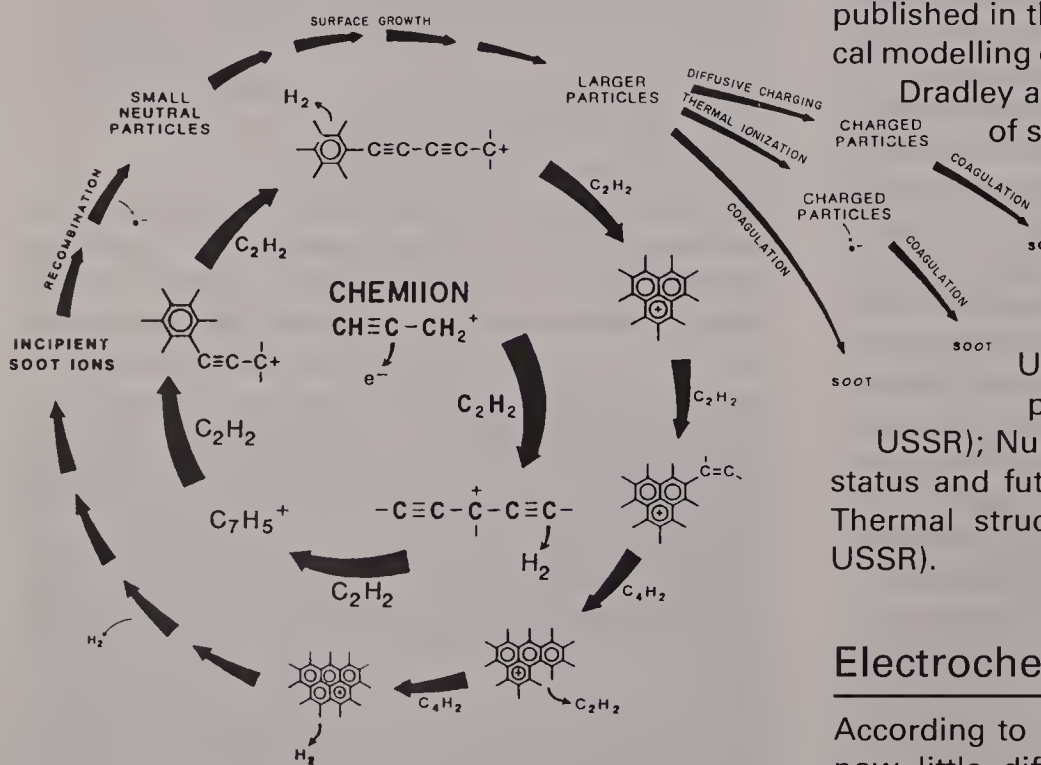


Figure. Chemi-ions to soot.

A paper on 'The role of ions in soot formation' by H. F. Calcote and D. G. Keil was one of eight plenary lectures presented at the 3rd International Seminar on Flame Structure held in Alma-Ata, USSR, 18–22 September 1989 and published in the May 1990 issue of *PAC*.

Calcote and Keil's paper indicates that the ionic mechanism of soot formation assumes rapid growth of ions from the chemi-ion $C_3H_3^+$ to form



H. Allen O. Hill:
research led to the
manufacture of a
glucose sensor for
home use by
diabetics.

The Oxford scientists achieved indirect electron transfer to various enzymes using ferrocenes as mediators and this led to the manufacture of a glucose sensor for home use by diabetics. They have now achieved the *direct* electrochemistry of metalloenzymes, that is, *without* mediation.

Hill presented a paper on 'The electrochemistry of metalloproteins' at the 27th International Conference on Coordination Chemistry held at Broadbeach, Australia, 2–7 July 1989. The plenary and session lectures from the conference were published in the June 1990 issue of *PAC*.

Amongst the contributors was IUPAC affiliate Vincenzo Balzani (Bologna, Italy) who delivered a lecture on 'Supramolecular photochemistry'. He pointed out that the photochemistry of supramolecular species is an emerging and rapidly growing research field.

His lecture reviewed recent results concerning the photochemical behaviour and luminescence of the following compounds and complexes: second-sphere coordination compounds of $\text{Co}(\text{CN})_6^{3-}$ and $\text{Pt}(\text{bpy})(\text{NH}_3)_2^{2+}$; cage-type complexes of Co^{3+} , Eu^{3+} , and Ru^{2+} ; and polynuclear Ru^{2+} complexes of polypyridine bridging ligands.

IUPAC affiliate Reed M. Izatt was one of number of authors from Utah, USA, who contributed a paper on 'Macrocycle–metal cation interactions involving polyaza macrocycles bonded to silica gel via a nitrogen donor atom'. Stable silica-gel bound macrocycles maintain the macrocycle for re-use in performing actual separation. The Utah group has made p.p.b. separations of heavy metal cations from concentrated matrices of other cations such as the alkali and alkaline earth cations.

The plenary lectures presented at the Broadbeach conference and published in this issue of *PAC* were: Intramolecular control of excited state electron and energy electron transfer (T. J. Meyer, USA); Transition metal thiolates: synthetic, catalytic, and biomimetic aspects (A. Nakamura *et al.*, Japan); Carbenes, carbides, and carbon; ten years of transition metal–acetylene chemistry (M. I. Bruce, Australia); and Interlacing molecular threads on transition metals (J. C. Chambron *et al.*, France).

Chemistry of natural products

The July 1990 issue of *PAC* contains the plenary and invited lectures presented at the 17th International Symposium on the Chemistry of Natural Products, held in New Delhi, India: 4–9 February 1990.

The first plenary lecture was presented by Prof. E. J. Corey (Harvard University, USA) and entitled 'New enantioselective routes to biologically interesting compounds'. Corey described new reagents and processes for the control of absolute and relative stereochemistry in the multistep synthesis of complex molecules and referred to studies on the following reactions: carbonyl reduction, Diels–Alder addition, aldol, carbonyl allylation, and $\text{C}=\text{C}$ oxidation. He also presented new insights on the origin and stereoselectivity in such processes.



**1990 Nobel
Chemistry Prize
Winner, Prof. E. J.
Corey presents his
lecture at the New
Delhi symposium.**

Solitary digger wasp

IUPAC affiliate Mohyee E. Eldefrawi (University of Maryland, USA) was one of nine authors of a paper on 'Philanthotoxin–433 (PhTX–433), a non-competitive glutamate receptor inhibitor' presented as a plenary lecture by Koji Nakanishi (Columbia University, USA).

The paper reports that a polyamine toxin present in the venom sac of the solitary digger wasp *Philanthus triangulum* has been isolated, characterized, and synthesized. This toxin, philanthotoxin–433 (PhTX–433), having a butyl/tyrosyl/polyamine structure, is a potent non-competitive inhibitor of the quisqualate sub-type glutamate receptor as assayed by the twitch contraction of locust. About 60 analogs of PhTX have been synthesized in order to clarify structure/activity relationships and to select candidates suitable for isolating the glutamate receptor by photoaffinity label and/or affinity label.



Prof. Koji Nakanishi reported on toxin present in the venom sac of the solitary digger wasp.

A paper by IUPAC affiliate G. B. Elyakov and colleagues from the Pacific Institute of Bio-organic Chemistry (Vladivostok, USSR) reviews new sulfated and glycosylated derivatives of marine tetracyclic isoprenoids isolated in their laboratory from echinoderms and sponges. The authors discuss structures of about 30 such products, some spectroscopic details, data on their biological activity and hypothetical pathways of biosynthesis.

Another IUPAC affiliate at the Natural Products Symposium was Prof. R. Vlahov (Institute of Organic Chemistry, Sofia, Bulgaria). He presented a plenary lecture on 'Synthesis of some new quinoline derivatives — potential antimalarial drugs'. The paper, which Vlahov co-authored with Drs St Parushev and J. Vlahov, describes a synthetic route for obtaining some 6-amino-2,4-dimethylquinoline compounds with various substituents at C-5 and C-8. These particular compounds are supposed to have a potential antimalarial activity.

Mycotoxins

IUPAC affiliates Roy Greenhalgh (Secretary of the Applied Chemistry Division) and Marc Savard (both from Agriculture Canada, Ottawa) were amongst the authors of a paper on 'Mycotoxins from *Fusarium* species: detection, determination and variety' presented as an invited lecture in the section on 'Natural Products and Human Health'.

The paper points out that the infestation of many crops by fungi of the *Fusarium* genus has extensive economic consequences. The authors present an update of the progress achieved by the Canadian programme aimed at an understanding of factors leading to the production of toxic secondary metabolites in nature and to the possible control of these materials. Their report concentrates on the biosynthetic diversity of common *Fusarium* species producing isoprenoids with biological activity.

Tobacco aroma

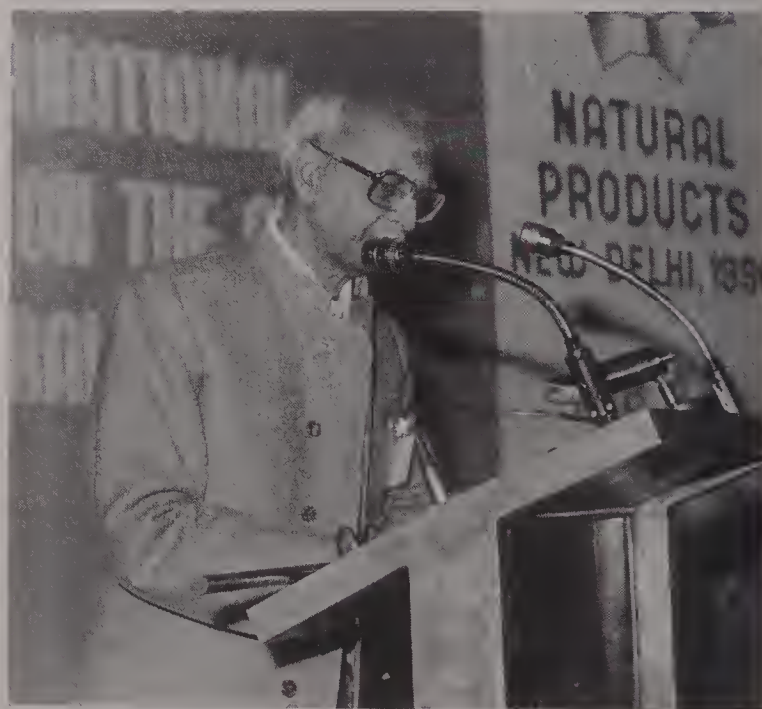
Tobacco aroma was one of the subjects of invited lectures presented in the section on 'Natural Products and Personal Sophistication'. The paper,

entitled 'Tobacco isoprenoids — precursors of important aroma constituents' was prepared by IUPAC affiliate Curt R. Enzell and colleague Inger Wahlberg (Reserca AB, Stockholm, Sweden).

They point out that much of the aroma of tobacco is attributable to the biodegradation of tobacco isoprenoids, predominantly of the cembranoid, labdanoid and carotenoid groups. Their paper focuses on the transformations of the cembranoids. They present evidence for the presence of several new cembrane-derived tobacco constituents and of their stereostructures along with major biogenetic pathways to explain the formation of most cembranic compounds known in tobacco to date.

The section on 'General Natural Products Chemistry' included an invited lecture on 'Biologically active compounds from marine organisms.' One of the six authors from the University of Oklahoma, USA, was IUPAC affiliate Dick van der Helm.

The authors describe how, in their search for cytotoxic compounds from marine animals, they have isolated representatives from various classes of nitrogen-containing compounds, most of which show cytotoxic activity. They discuss structure elucidation of these compounds. Included among the isolates are new acylated spermidines, polycyclic aromatic alkaloids related to amphimedine and 2-bromoleptoclinidinone, and a representative of a novel sulfur containing 3,5,8-isoquinoline-trione.



Symposium Chairman Prof. Sukh Dev welcomes participants at the opening ceremony.

Global significance of terpenes

Guy Ourisson (Laboratoire de Chimie des Substances Naturelle, Strasbourg, France), who was IUPAC Secretary General from 1975 to 1983 and is now an IUPAC affiliate, presented a paper on 'The



(Right) Prof. Guy Ourisson speaking as IUPAC representative. (Above left) Ourisson with hand to mouth is seated between Prof. Carl Djerassi on his right and Symposium Secretary Dr A. V. Rama Rao on his left.



general role of terpenes and their global significance'.

He points out in the paper that terpenes are universally present in small amounts in living organisms, where they play general roles in membranes. On the other hand, they are also accumulated in many cases. Ourisson shows that the extraordinary variety they then display can be due to ecological factors playing an ecological role. He provides examples to show that such an ecological role can be either 'obvious', when these secondary metabolites are biologically inactive, or 'hidden', when they are toxic and a potential deterrent, or simply active as hormones.

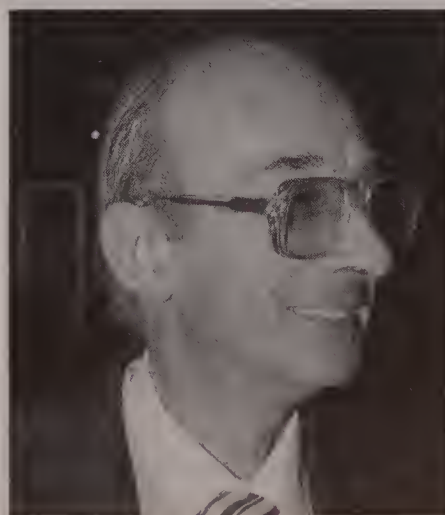
IUPAC affiliate and Executive Committee member Shô Itô also presented an invited lecture in the section on 'General Natural Products Chemistry'. His paper is entitled 'A few new methods for asymmetric synthesis'. The new methods include the Aza-Claisen rearrangement of amide enolates.

The final section of the New Delhi symposium concerned 'Bio-organic Chemistry'. Topics of invited lectures in this section included: fungal polypeptides; phytochrome; human chorionic gonadotropin; antiviral vaccines; esterases; and transmembrane proteins.

PAC Editorial Advisory Board

Prof. Casper Schutte of the University of South Africa, Pretoria, has been appointed Chairman of the *Pure and Applied Chemistry* Editorial Advisory Board — starting January 1991. He succeeds Prof. David Whiffen whose 4-year term as Chairman finished at the end of 1990.

Schutte was a member of the Committee on Publications from 1986 to 1990 and is currently Chairman of the Commission on Molecular Structure and Spectroscopy (I.5).



Prof. Casper Schutte.

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

The study of microstructures of poly(vinyl alcohol) by NMR

The microstructures of various poly(vinyl alcohol) samples have been studied by ^1H - and ^{13}C -NMR techniques. Spectra taken in a mixed solvent (d_6 -DMSO [$= (\text{CD}_3)_2\text{SO}$] and D_2O) show marked changes when the ratio d_6 -DMSO to D_2O is varied. This may be due to conformation changes.

The concentration of 1,2-glycol linkages has been determined quantitatively in the ^1H -NMR spectrum. Weak features, arising from end-groups formed by the chain transfer reactions to monomer or polymer, have been identified in the spectrum.

One of the major end-groups has been determined to exist in the γ -lactone form under acidic conditions, and in the carboxylic acid sodium salt form under alkaline conditions. No free carboxylic acid group has been detected.

The short chain branches consisting of two monomer units (butyl branches) have also been estimated. Other structural irregularities — polyene structures arising from heat treatment — were analysed by a two-dimensional NMR (COSY) method.

This report was prepared for publication by S. Amiya, S. Tsuchiya, R. Qian and A. Nakajima, Working Party on Structure and Properties of Commercial Polymers, Commission on Polymer Characterization and Properties, Macromolecular Division, and published in PAC, Vol. 62, No. 11, pp. 2139–46, 1990.



A recent report in *PAC* considers the present and future status of organic analytical reagents. (Photo courtesy Roche.)

Present and future status of organic analytical reagents — Part I: General remarks

The earlier emphasis of organic analytical reagents (OAR) for UV–visible spectrophotometric analysis has now broadened to encompass most modern instrumental methods of analysis. The main factors to be considered in the *a-posteriori* examination, investigation by computational methods, nature of coordination selectivity and the *a-priori* prognosis of OAR are surveyed.

The literature, 1970–1985, has been surveyed to prepare a list of compounds, classified by functional group, regarded as important usage. Further papers will consider specific aspects and compounds important for individual instrumental techniques such as NMR spectroscopy, atomic absorption spectroscopy and electroanalysis.

This report was prepared for publication by L. Sommer, G. Ackermann, D. Thorburn Burns and S. B. Savvin, Commission on General Aspects of Analytical Chemistry (formerly the Commission on Analytical Reactions, Reagents and Separations), Analytical Chemistry Division, and published in PAC, Vol. 62, No. 11, pp. 2147–66, 1990.

A glossary of atmospheric chemistry terms (Recommendations 1990)

Over 620 atmospheric chemistry terms which are in common use by the international research community in the atmospheric sciences are defined. The diverse nature of the scientists involved in research in atmospheric chemistry (chemists, meteorologists, physicists, biologists, engineers, and others) requires that special attention be paid to the consistency of the terminology used.

Where alternative terms are in common use to describe a given process, piece of equipment, feature, or quantity used in atmospheric chemistry, recommended choices of the Commission on Atmospheric Chemistry are given; these are consistent with other IUPAC publications and recommendations on nomenclature.

The range of terms includes composition of the atmosphere, clouds, solar radiation, chemical and physical changes in atmospheric components, instrumentation employed in analysis of the atmospheric components and in air quality control, and in effects of certain trace gases on materials, plants and animals.

This report was prepared for publication by Jack G. Calvert, Commission on Atmospheric Chemistry,



Over 620 terms are defined in the IUPAC Glossary of atmospheric chemistry terms. (Photo courtesy NASA.)

Applied Chemistry Division, and published in PAC, Vol. 62, No. 11, pp. 2167–219, 1990.

A synopsis of the report was published as *Provisional Recommendations in CI*, Vol. 11, No. 2, p. 68, 1989. The *Provisional Recommendations* were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of October 1989 were taken into consideration when preparing the final report.

Present and future status of organic analytical reagents — Part II. Inorganic chemical analysis: classical methods, molecular spectroscopy (absorption and emission) and solvent extraction

Following the general introduction to the present and future status of organic analytical reagents (OAR), *a-priori* prognosis — *a-posteriori* examination, aspects of inorganic chemical analysis are reviewed with emphasis on current practice, recent developments and trends.

The technique areas included are qualitative tests, gravimetric and titrimetric procedures, solvent extraction and molecular absorption and luminescence spectroscopy in the UV–visible absorption spectrophotometry — the use of low temperatures and chemiluminescent reactions; in solvent extraction — an increased interest in ion-association reactions, use of macrocyclic ligands, application of kinetic factors, solid–liquid and flotation systems.

This report was prepared for publication by L. Sommer, G. Ackermann, and D. Thorburn Burns, Commission on General Aspects of Analytical Chemistry (formerly the Commission on Analytical

Reactions, Reagents and Separations), Analytical Chemistry Division and published in PAC, Vol. 62, No. 12, pp. 2323–38, 1990.

Determination of the iodine value of oils and fats: results of a collaborative study

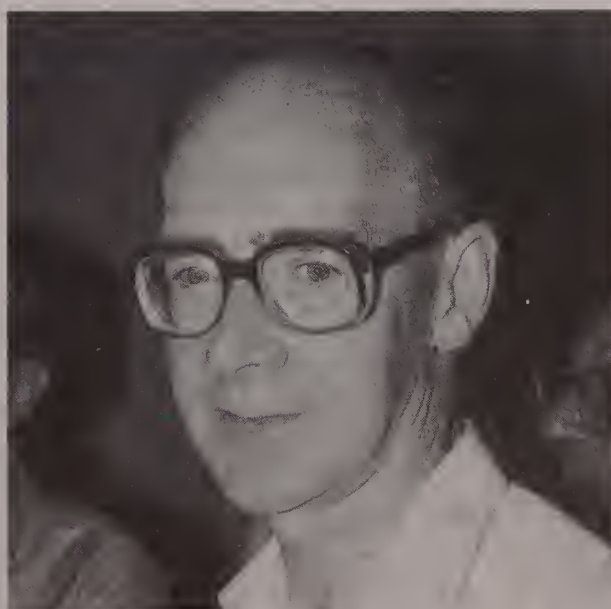
This report outlines the study protocols and compares the results obtained for the iodine values of a wide range of fats and oils when using the published standardized method (which specifies the use of carbon tetrachloride) with the results obtained when using a mixture of cyclohexane and glacial acetic acid. The values reported for the iodine values indicate that the latter solvent system can be recommended for use in place of carbon tetrachloride in the determination of iodine value without loss of precision.

This report was prepared for publication by W. D. Pocklington, Commission on Oils, Fats and Derivatives, Applied Chemistry Division, and published in PAC, Vol. 62, No. 12, pp. 2339–43, 1990.

A survey of experimental techniques in surface chemical physics

The major techniques presently used for characterizing solid surfaces are summarized in this report. These techniques include interactions (or release) of photons, electrons and neutral or charged atoms and molecules, and other miscellaneous methods which may be applied to single crystal surfaces or polycrystalline material.

This report was prepared for publication by J. H. Block, A. M. Bradshaw, P. C. Gravelle, J. Haber,



Duncan Thorburn Burns (UK) was Chairman of the Commission on Analytical Reactions, Reagents and Separations from 1987 to 1989 and one of the authors of the reports on 'Present and future status of organic analytical reagents'.

R. S. Hansen, M. W. Roberts, N. Sheppard and K. Tamaru, *Commission on Molecular Structure and Spectroscopy and Commission on Colloid and Surface Chemistry including Catalysis, Physical Chemistry Division, and published in PAC, Vol. 62, No. 12, pp. 2297–322, 1990.*

Polarographic half-wave potentials of cations in non-aqueous solvents

Polarographic half-wave potentials for the reduction of Li^+ , Na^+ , K^+ , Rb^+ , Cs^+ , Cu^+ , Ag^+ , Tl^+ , Mn^{2+} , Co^{2+} , Ni^{2+} , Cu^{2+} , Zn^{2+} , Cd^{2+} , Ba^{2+} , Pb^{2+} , UO_2^{2+} , La^{3+} , Ce^{3+} , Pr^{3+} , Nd^{3+} , Sm^{3+} , SM^{2+} , Eu^{3+} , Eu^{2+} , Gd^{3+} , Tb^{3+} , Dy^{3+} , Ho^{3+} , Tm^{3+} , Er^{3+} , Yb^{3+} and Yb^{2+} versus bis(biphenyl)chromium(I)/(O) have been

compiled in up to 38 non-aqueous solvents. The potentials of the silver/0.01 mol dm^{-3} silver(I) ion electrodes and the Hg/0.01 mol dm^{-3} mercury(II) ion electrodes in the respective supporting electrolytes as well as the $\frac{1}{2}(E_{\text{pa}} + E_{\text{pc}})$ values for the oxidation of ferrocene versus bis(biphenyl)chromium(I)/(O) are included. The accessible potential ranges on the dropping mercury electrode in polarography and on the platinum electrode in cyclic voltammetry are given together with the specific conductivities of 0.1 mol dm^{-3} solutions of tetrabutylammonium perchlorate in the respective solvents.

This report was prepared for publication by G. Gritzner, Commission on Electrochemistry, Physical Chemistry Division, and published in PAC, Vol. 62, No. 9, pp. 1839–58, 1990.

Publications

Unsteady state processes in catalysis

Unsteady state processes in catalysis is the proceedings of the International Conference on Unsteady State Processes in Catalysis (USPC), organized by the Siberian Branch of the USSR Academy of Sciences, Institute of Catalysis, which was held in Novosibirsk in June 1990.

The performance of catalytic conversion processes, in particular in the gaseous phase, are improved substantially when unsteady state conditions are enforced. These enforced conditions may take the form of changes in concentration or temperature of gases entering the catalytic converter, or the periodic reversal of the entrance and exit of reacting gases in the converter.

An additional benefit of unsteady state processes in catalysis is that preheating of reacting gases is eliminated, thus reducing the size and price of the plant because the heat exchangers required are smaller; in some operations they may not be required at all.

The proceedings of the USPC conference scientific programme consists of 59 papers grouped into the following sections.

- Kinetic studies under unsteady state conditions
- Mathematical modelling and optimization of processes in forced unsteady state conditions
- Catalytic processes and reactors under unsteady operation

In addition, the volume contains the transcripts of the following invited lectures: Theory and industrial application of SO_2 oxidation reverse-process for sulfuric acid production (G. A. Bunimovich, V. O.



(Left) IUPAC Bureau member and USPC Conference Chairman Kirill Zamaraev (standing) greets participants at the opening ceremony. Past-President Valentin Koptug (seated) was the official IUPAC representative. (Above) Participants take a break during the conference.

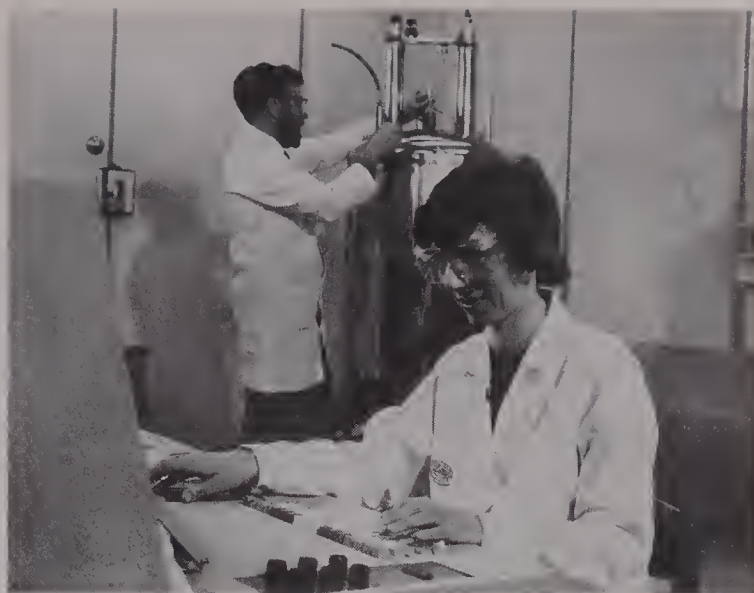
Strots and O. V. Goldman); The remote control mechanism: general phenomena, possible consequences concerning unsteady state processes (B. Delmon and H. Matralis); Oscillating rates of CO-oxidation on single crystal planes: a survey of recent mechanistic studies (M. Ehsasi and J. H. Block); Reversed flow operation of fixed bed catalytic reactors (G. F. Froment); Control of unsteady state of catalysts in fluidized bed (A. A. Ivanov and B. S. Balzhinimaev); Characterization of the structure sensitivity in heterogeneous catalysis by the transient response method (M. Kobayashi, T. Kanno, H. Takeda and A. Nakagawa); Performance of catalytic processes under steady-state conditions (Yu. Sh. Matros); Methods of non-linear dynamics in studies of forced catalytic systems (J. Orsag and M. Marek); Applications of unsteady state processes in modelling heterogeneous catalytic kinetics (A. Renken); Dynamics of catalytic reactions on metal surfaces (L. D. Schmidt and R. Aris); New applications of periodic operations (P. L. Silveston); Investigation of fermentation kinetics by transient methods (J. Villadsen); Dynamic experiments for the analysis of complex heterogeneous catalytic reactions (S. N. Wang and H. Hofmann); and Decoking of fixed bed catalytic reactors (K. R. Westerterp, H. J. Fontein and F. P. H. van Beckum).

Unsteady state processes in catalysis *edited by Yu. Sh. Matros* was published by VSP, Utrecht, The Netherlands, 1990. 712 pp. ISBN 90-6764-127-8 bound. Price: DEM 321.00/USD 191.00.

Excellence in chemistry

The June 1990 issue of *International Newsletter on Chemical Education* (No. 33) is concerned principally with the major presentations to the IUPAC-sponsored 10th International Conference on Chemical Education held in September 1989 in Waterloo, Canada. The theme of the conference was 'Excellence in chemistry'. The issue includes the following articles.

- Chemical knowledge for every educated person (R. J. Gillespie, McMaster University, Canada)
- Teaching for excellence of learning in chemistry (P. J. Fensham, Monash University, Australia)
- STS (Science, technology and science) science: Unifying the goals of chemistry education (Harry Ainlay Composite High School, Canada)
- The world of chemistry (R. Hoffman, Cornell University, USA)
- The search for excellence: What we have and what we do not (C. M. Castro-Acuna, Universidad Nacional Autonoma de Mexico)
- The growth of a university chemistry department (T. Gebreyesus, Addis Ababa University, Ethiopia)



The 10th International Conference on Chemical Education was concerned with 'Excellence in chemistry'. (Photo courtesy Lilly Industries Ltd.)

- Paradigms in research and parables in teaching (D. R. Hershbach, Harvard University, USA)
- What and how we teach chemistry: Some misleading concepts (K. Tamru, Science University of Tokyo, Japan)
- Research of university chemical education in China (Tong-Wen Hua, Peking University, and Zufu Chen, State Education Commission, People's Republic of China)
- Initiatives of the Dutch Chemical Society (J. Bouma, Vrije Universiteit, The Netherlands)
- What's new about teaching problem solving (D. R. Woods, McMaster University, Canada).

Toxic organic chemicals in porous media

In March 1983, a workshop on 'Pollutants in porous media' was hosted by the Institute of Soils and Water of the Agricultural Research Organization in Bet Dagan, Israel. At this workshop, the unsaturated zone between the soil surface and groundwater was the focal point of discussions for scientists from various disciplines, such as soil chemists, physicists, biologists and environmental engineers. Since then, the problem of soil and water pollution has only worsened as more and more cases of pollution caused by human activities including agriculture and industry have been revealed.

A great deal of work has been carried out by environmental scientists since 1983 in elucidating the behaviour of the many classes of pollutants and the complex physical, chemical and biological transformations which they undergo as they move through the soil to the vadose zone and, in many cases, the groundwater. In light of this a 2nd International Workshop on the Behaviour of Pollutants in Porous Media, sponsored by IUPAC and IAHS (International Association of Hydrological



The behaviour of pesticides in porous media was amongst the subjects considered at the second Bet Dagan workshop.

Sciences) was organized and held in the Institute of Soils and Water of the Agricultural Research Organization in Bet Dagan, Israel during June 1987.

The publication *Toxic organic chemicals in porous media* contains a selection of the talks presented at the second workshop and deals only with toxic organic chemicals in porous media. Inorganic chemicals are treated in a companion volume (Bar-Yosel B., Barrow N. J., Goldshmid Y. *Inorganic contaminants in the vadose zone* (Ecological Studies, Vol. 74). Springer Verlag, Heidelberg, 1989).

The present volume is divided into five parts. Part one provides two general and different outlooks on the scope and extent of the problem. The following four sections deal with different aspects of this problem, but due to the complex and multidisciplinary nature of the pollution of soils and water by toxic organic chemicals, these chapters cannot be all inclusive. Rather, they reflect the ideas and opinions of the participants in the workshop. The five parts are:

1. Overview of the problem;
2. Physicochemical and biological interactions with porous media;
3. Pesticides in porous media;
4. Petroleum hydrocarbons; and
5. Restoration of the unsaturated zone and groundwater.

Toxic organic chemicals in porous media (*Ecological Studies*, Vol. 73) edited by Z. Gerstl, Y. Chen, U. Mingelgrin and B. Yaron was published by Springer-Verlag, Heidelberg, FRG, 1989. xiii + 343 pp. ISBN 3 540 50799 X/0 387 50799 X. Price: USD 79.50.

Raman spectroscopy

The IUPAC-sponsored 12th International Conference on Raman Spectroscopy was held in Columbia, South Carolina, USA, 13–17 August 1990. The proceedings contain the texts of the plenary and contributed papers presented at the conference. They start with four-page texts of the 15 plenary lectures and the remainder of the volume consists of 416 two-page summaries of the scientific papers grouped into the following sections.

1. Raman theory.
2. Vibrational analysis and molecular structure.
3. Non-linear Raman spectroscopy.
4. SERS, surfaces and interfacial phenomena.
5. Inorganic materials and matrices, superconductors.
6. The solid state, phase transitions, and effects of temperature/pressure.
7. Resonance Raman spectroscopy.
8. Time-resolved Raman scattering and transient species.
9. Biological systems.
10. Macromolecules and polymers.
11. Band shapes and dynamics.
12. Band intensities.
13. Industrial/medical applications.
14. FT-Raman/new techniques.

XII International Conference on Raman Spectroscopy edited by J. R. Durig and J. F. Sullivan was published by John Wiley & Sons, Chichester, UK, 1990. xiii + 919 pp. ISBN 0 471 92785 6. Price: GBP 90.00/USD 181.15.

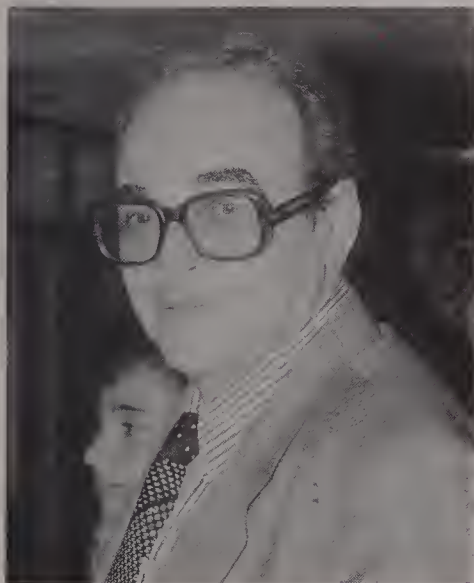


Participants at the 12th International Conference on Raman Spectroscopy were accommodated at Capstone House on the University of South Carolina campus.

Molecular design of functional polymers

A total of 247 papers from 20 countries were presented at the IUPAC-sponsored International Symposium on Molecular Design of Functional Polymers held in Seoul, Korea, 26–28 June 1989. The scientific programme was divided into five topics:

1. Synthetic methods for the control of structure;
2. Polymers for separation processes;
3. Photosensitive polymers;
4. Biomedical polymers; and
5. Polymers with specific electrical properties.



Victor Kabanov.

A selection of the plenary and invited lectures from this meeting were published in Volume 33 of *Makromol. Chem. Macromol. Symp.* (March 1990). They included a plenary lecture by Profs. T. Saegusa and Y. Chujo (Japan) on 'Functional polymers based on high hydrophilicity of poly (2-methyl-2-oxazoline)'.

Victor Kabanov (Moscow State University, USSR), who was a member of the IUPAC Macromolecular Division, presented a lecture on

'Design of target-specific polymer conjugates and complexes for biomedical application'.

Kabanov's paper described a new method for the synthesis of protein–protein and protein–water soluble linear polymer conjugates using hydrated reversed micelle systems. Such conjugates are important, especially for biomedical applications.

One example represents a new family of receptor-specific screened immunotoxins (respecrins) whose toxic effect develops only with respect to the target but not to the other cells. Kabanov confirmed the general mechanism for the search and recognition of target immune cells by such conjugates *in vivo* in model experiments using cell-mimetic particles. He also showed that complexing of the DNA plasmid with the carbochain polycation resulted in formation of membrane-active polycomplexes which were much more active in transformation of competent cells than pure plasmid.

Evaluation of reagent strips

The International Federation of Clinical Chemistry (IFCC) has published a report containing 'Guidelines for evaluation of reagent strips. Exemplified by analysis of urine albumin and glucose concentration using visually read reagent strips'. The report appeared in *Scand J. Clin. Lab. Invest.* Vol. 49, pp. 689–99, 1989.

Reagent strips are frequently used in the practice of laboratory medicine as well as outside professional laboratories. In this report, a scheme is presented which allows a reproducible description of the performance of reagent strips.

This is exemplified using strips intended for estimation of urinary albumin and glucose. Experimental conditions which are particularly important for these components are given. Suitable and necessary items which should be included in the protocol presenting results of an evaluation are listed.

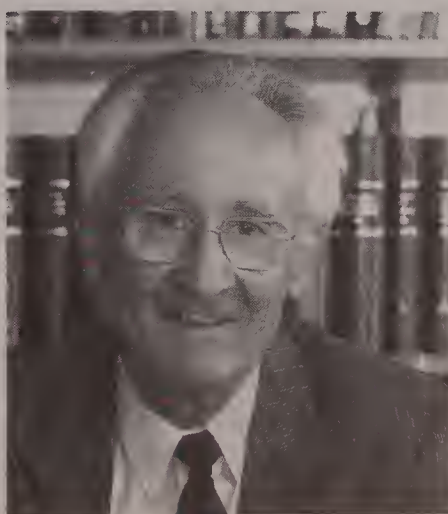
Conferences

Organic chemistry: technological perspectives Baden-Baden, FRG 15–19 April 1991



The 2nd International IUPAC Symposium on Organic Chemistry: Technological Perspectives will be held at the Congress Centre, Baden-Baden.

The scientific programme will consist of plenary lectures, main lectures, short communications and poster sessions. Nowadays, technological innovation involves not only the production of new materials with interesting properties and applica-



Prof. G. Wilke,
Member of the
Organizing
Committee for the
Baden-Baden
symposium.



Kongresshaus Baden-Baden.

tions, but also the development of processes which are environmentally sound, energetically efficient and also minimize the consumption of raw materials. Accordingly, the symposium topics will include the following.

- The synthesis of new products of technological interest; active components for pharmaceuticals and agrochemicals; novel monomers and intermediates; technically important constituents for instance catalysts, additives, dyestuffs and so on
- Novel synthetic routes; catalytic and stoichiometric reactions; biotechnological processes
- The development and utilization of new raw materials

The official language of the symposium will be English. Baden-Baden is located between the hilly woodlands of the Black Forest and the upper Rhine valley. The town owes its international reputation to the radioactive hot saline springs which have made it a major spa since Roman times when it was known as 'Aquae Aurelia'.

The nearest airports are Frankfurt/Main and Strasbourg/France. There are approximately hourly train connections from Frankfurt airport to Baden-Baden. The modern Kongresshaus is conveniently located beside a large park within easy reach of Baden-Baden.

Harmonization of quality assurance schemes

Geneva, Switzerland

2–3 May 1991

The 4th International Symposium on the Harmonization of Quality Assurance Schemes for Analytical Laboratories will take place at the ISO Secretariat, Geneva, Switzerland on 2 and 3 May 1991.

Using as a basis the proceedings of the previous symposium held in Washington, USA in April 1989

(see *CI*, Vol. 12, No. 1, pp. 31-3, 1990), The 4th symposium aims to collect further information on the state of the art of analytical quality assurance schemes of leading respected laboratories. The symposium also aims to find the minimum common basis for harmonization.

Further aims of the symposium include:

- Preparation of a draft document for comment;
- Workshop discussion of the document;
- Preparation of a protocol for submission to the IUPAC Divisions of Analytical Chemistry, Applied Chemistry and Clinical Chemistry, to AOAC and to ISO/TC 47 for their scrutiny and voting procedure; and
- Publication of harmonized IUPAC Protocols, AOAC Guidelines and ISO International Standards.

The registration fees before/after 1st February 1991 are USD 250/USD 300 for delegates and observers and USD 80/USD 100 for accompanying persons.

Hotel accommodation is available near the ISO Central Secretariat at rates ranging from CHF 105 to CHF 122 (single).

Registration forms and further information is available on request from: Dr M. Parkany, Standards Development, ISO Central Secretariat, 1, rue de Varembé, CH-1211 Genève 20, Switzerland. Tel: +41 (22) 734 12 40. Fax: +41 (22) 733 34 30.

Correlation analysis in organic chemistry

The 5th International Conference on Correlation Analysis in Organic Chemistry will be held in Paris, France from 1 to 6 July 1991.

Further information from: Conference Secretariat, Vth CAOC, A. Panaye, ITODYS, Université de Paris VII, 1, rue Guy de la Brosse, 75005 Paris, France.

Chemical sciences in development

An International Conference on Chemical Sciences in Development will be held in Colombo, Sri Lanka, 14–18 May 1991 on the occasion of the Golden Jubilee of the founding of the Chemical Society of Ceylon, the predecessor to the Institute of Chemistry, Ceylon. The conference language will be English.

For further information contact: The Chairman, Organizing Committee, International Conference on Chemical Sciences in Development, Institute of Chemistry, Ceylon, vidya Mandiraya, 120/10, Vidya Mawatha, Colombo 7, Sri Lanka.

Fourth Asian Chemical Congress

The 4th Asian Chemical Congress will be held in Beijing, China, 26–30 August 1991. The congress is being sponsored by the Federation of Asian Chemical Societies (FACS) and organized by the Chinese Chemical Society.

The theme of the congress is the important role of chemistry in raising the health conditions and living standards of mankind.

The scientific programme will consist of plenary lectures and invited and contributed papers on topics grouped into the following ten sections.

1. Organic chemistry of natural products.
2. Analytical chemistry and analytical instrumentation.
3. Environmental chemistry.
4. Agrochemistry.
5. Coordination chemistry and its applications in medicine, agriculture, etc.
6. Polymer science.
7. Photochemistry.
8. Chemical education.

9. Computers in the practice of chemistry.
10. Catalysis.

The official language will be English.

All correspondence should be addressed to: Professor Dehe Zhang, Secretary-General of 4ACC, c/o Chinese Chemical Society, PO Box 2709, Beijing 100080, China.

Isoprenoids

The 14th Conference on Isoprenoids, organized by the Czechoslovak Academy of Sciences, will be held in Tábor, Czechoslovakia, 15–21 September 1991. The conference will be concerned with the isolation, structure elucidation, reactivity, structure and activity relationships, synthesis and biosynthesis of isoprenoids.

For further information contact: Dr L. Kohout, Institute of Organic Chemistry and Biochemistry, Czechoslovak Academy of Sciences, Flemingovo nám. 2, 166 10 Prague 6, Czechoslovakia. Telex: 122 192 IOCB C.

EURASIA conference

The 3rd EURASIA Conference on Chemistry will be held in the Philippines in January 1992. This new chemistry conference series is held every 2 years in a developing country to help stimulate the growth of chemical sciences in developing countries through the participation of top-level chemists.

A National Organizing Committee has been constituted by the Federation of Philippine Chemistry Societies. This committee will coordinate with regional chemical societies.

Further information from: Dr Lydia C. Crisostomo, Integrated Chemists of the Philippines, c/o Laboratory Services Division, Division of Plant Industry, Manila, Philippines.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1991

Polymer materials

10–15 February. Polymer 91: International Symposium on Polymer Materials: Preparation, Characterization and Properties. Melbourne, Australia. (Dr G. B. Guise, Polymer 91 Secretary, PO Box 224, Bel-

mont, Victoria 3216, Australia. Tel: +61 (52) 47 2695. Fax: +61 (52) 21 7971.)

Organic chemistry: technological perspectives

15–19 April. 2nd International

Symposium 'Organic Chemistry: Technological Perspectives'. Baden-Baden, FRG. (Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, FRG.)

Pharmaceutical and biomedical analysis

28 April–1 May. 3rd International Symposium on Pharmaceutical and Biomedical Analysis. Boston, MA, USA.
(Dr S. H. Y. Wong, Director, Drug Analysis Division, University of CT Health Center, 263 Farmington Avenue, Farmington, CT 06032, USA.)

Vapor–liquid equilibrium

13–17 May. 6th International Workshop on Vapor–Liquid Equilibrium in 1-Alkanol + *n*-Alkane Mixtures. Liblice, Czechoslovakia.
(Prof. R. Holub, Vysoka Skola Chemicko-Technologicka, Katedra Fyzikalni Chemie, Suchbatarova 5, 166–28 Prague, Czechoslovakia.)

Spectroscopy

9–14 June. 17th Colloquium Spectroscopicum Internationale. Bergen, Norway.
(17th Colloquium Spectroscopicum Internationale, HSD Congress – Conference, PO Box 1721 Nordnes, N. 5024 Bergen, Norway.)

Solution properties of modified polymers

10–14 June. 8th Bratislava

International Conference on Solution Properties of Modified Polymers. Tatranska Lomnica, High Tatras, Czechoslovakia.
(Dr J. Barton, Polymer Institute, Slovak Academy of Sciences, 842–36 Bratislava, Czechoslovakia.)

Calorimetry and chemical thermodynamics

24–28 June. International Symposium on Calorimetry and Chemical Thermodynamics. Moscow, USSR.
(Prof. L. V. Gurvich, Thermocenter of the USSR Academy of Sciences, IVTAN, Izorskaya St. 13/19, Moscow 127412, USSR.)

Surface and Colloid Science

7–12 July. 7th International Conference on Surface and Colloid Science. Compiègne, France.
(Secretariat of the 7th ICSCS, c/o Wagons-Lits Tourisme, BP 244, F-92307 Levallois-Perret Cédex, France.)

Computers in chemical research and education

14–19 July. 10th International Conference on Computers in Chemical Research and Education. Jerusalem, Israel.
(Prof. Y. Wolman, Department

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably **2 YEARS** and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *CI*, Vol. 11, No: 1, pp. 4–5, 1989.

of Organic Chemistry, The Hebrew University, Jerusalem 91904, Israel.)

Solution chemistry

14–19 July. 22nd International Conference on Solution Chemistry. Linz, Austria.
(Prof. G. Gritzner, Institut für Chemische Technologie, Anorganischer Stoffe, Johannes Kepler Universität Linz, A-4040 Linz-Auhof, Austria.)

Rheology of polymer melts

15–18 July. 14th Discussion Conference on Macromolecules: Rheology of Polymer Melts. Prague Czechoslovakia.
(14th Discussion Conference, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia. Tel: +42 (2) 360341. Fax: +42 (2) 367981. Telex: 122019 IMCP C.)

Plasma chemistry

29 July–4 August. 10th International Symposium on Plasma Chemistry. Jerusalem, Israel.
(Prof. R. Avni, Conseiller Scientifique, Ambassade d'Israel, 3 rue Rabelais, F-75008 Paris, France.)

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than 3 months in advance. If a visa is not granted 1 month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

In the case of the 32nd IUPAC Congress (Stockholm, Sweden: 2–7 August 1989), it was observed that the time for treating visa applications in Sweden may be as long as 5–6 weeks. To this must be added the time for handling the applications at the Swedish Embassy in the various countries of the intending participants. This confirms the need for applications to be made not less than 3 months in advance.

IUPAC General Assembly

7–15 August. 36th IUPAC General Assembly. Hamburg, FRG (The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

IUPAC Congress

17–22 August. 33rd IUPAC Congress. Budapest, Hungary. (33rd IUPAC Congress, Prof. E. Pungor, c/o Hungarian Academy of Sciences H-1111 Budapest, Gellért tér 4, Hungary. Tel: + 36 (1) 851 477 Telex: 225931 MUEGY H.)

Organometallic chemistry

25–29 August. 6th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS). Utrecht, The Netherlands. (Symposium Secretariat OMCOS 6, Congress Bureau, Royal Netherlands Industries Fair, PO Box 8500, 3503 RM Utrecht, The Netherlands.)

Chemical education

25–30 August. 11th International Conference on Chemical Education. York, UK. (Prof. D. J. Waddington, Department of Chemistry, University of York, Heslington, York YO1 5DD, UK.)

Analytical sciences

25–31 August. International Congress on Analytical Sciences. Chiba, Japan. (ICAS '91 Secretariat, The Japan Society for Analytical Chemistry, 1–26–1, Nishigotanda, Shinagawa, Tokyo 141, Japan.)

Cationic polymerization

26–29 August. 10th International Symposium on Cationic Polymerization and Related Ionic Processes. Balatonfüred, Hungary. (Prof. T. Kelen, Institute of Applied Chemistry, Kossuth Lajos University, H-4010 Debrecen, Hungary.)

Self-propagating high-temperature synthesis (SHS)

September. 1st International Symposium on Self-Propagating High-Temperature Synthesis (SHS). Alma-Ata, USSR. (Dr O. E. Kashireninov, Institute



The 14th Discussion Conference on Macromolecules: Rheology of Polymer Melts will take in Prague from 15 to 18 July 1991.

of Structural Macrokinetics, 142432 Chernogolovka, Moscow Region, USSR.)

Spectroscopy of biological molecules

1–6 September. 4th European Conference on the Spectroscopy of Biological Molecules. York, UK. (Prof. R. E. Hester, Department of Chemistry, University of York, York YO1 5DD, UK.)

Macrocyclic chemistry

1–6 September. 16th International Symposium on Macrocyclic Chemistry. Sheffield, UK. (Dr D. E. Fenton, Department of Chemistry, The University, Sheffield S3 7HF, UK.)

Mössbauer effect

16–20 September. International Conference on the Applications of the Mössbauer Effect. Nanjing, China. (Prof. Yuanfu Hsia, ICAME '91, Department of Physics, Nanjing University, Nanjing 210008, China.)

Electron spin echo spectroscopy

25–28 September. International Workshop on Electron Echo Spectroscopy. Novosibirsk, USSR. (Prof. Yu. D. Tsvetkov, Institute of Chemical Kinetics & Combustion, Novosibirsk 630090, USSR.)

Macromolecule–metal complexes

30 September–5 October. 4th International Symposium on Macromolecule–Metal Complexes. Siena, Italy. (Prof. R. Barbucci, Dipartimento di Chimica, Università di Siena, Piano dei Mantellini 44, 53100 Siena, Italy.)

New polymers

30 November–1 December. International Symposium on New Polymers. Kyoto, Japan. (Prof. Toshinobu Higashiura, Department of Polymer Chemistry, Kyoto University, Yoshida, Sakyo-ku, Kyoto 606, Japan.)

CHEMRAWN VII

2–6 December. World Conference on Chemistry of the Atmosphere: Its Impact on Global Change. Baltimore, Maryland, USA.

(Prof. Robert Sievers, Director of CIRES, Campus Box 216, University of Colorado, Boulder, CO 80309-0216, USA.)

1992

Organic synthesis

6–9 January. International Symposium on Enzymes in Organic Synthesis. New Delhi, India.

(Dr V. S. Palmar, Department of Chemistry, University of Delhi, Delhi-110007, India.)

Organic synthesis

5–9 July. 9th International Conference on Organic Synthesis. Montréal, Québec, Canada.

(Prof. Jean-Claudé Richer, Département de Chimie, Université de Montréal, CP 6128 Succursale A, Montréal, Québec H3C 3J7, Canada.)

Ring opening polymerization

7–12 July. International Symposium on Ring Opening Polymerization. Warsaw, Poland.

(Prof. Zbigniew J. Jedlinski, Institute of Polymer Chemistry, Polish Academy of Sciences, 34 M. Curie Skłodowska St., 41-300 Zabrze, Poland.)

Risk management of chemicals

13–16 July. International Symposium on Risk Management of Chemicals: Can Chemicals be Used Safely? Guildford, UK.

(Dr J. F. Gibson, Secretary (Scientific), The Royal Society of Chemistry, Burlington House, London W1V 0BN, UK. Tel: +44 (71) 4378656.)

Macromolecules

13–18 July. 34th International Symposium on Macromolecules. Prague, Czechoslovakia.

(IUPAC Macro 92 Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského nám. 18882/2, 16206 Prague 6, Czechoslovakia. Tel: +42 (2) 360317. Telex: 122019 IMCP C.)

Coordination chemistry

19–24 July. 29th International Conference on Coordination Chemistry. Lausanne, Switzerland.

(Prof. A. E. Mercach, Institut de Chimie Minérale et Analytique, Université de Lausanne, Place du Château 3, CH-1005 Lausanne, Switzerland.)

Exploration, mining and processing of materials

3–7 August. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Randburg, Transvaal, Republic of South Africa.

(Dr V. C. O. Schuler, PO Box 35307, Northcliffe, 2115, Republic of South Africa.)

Natural products

30 August–4 September. 18th International Symposium on Natural Products. Strasbourg, France.

(Prof. G. Ourisson, Centre de Neurochimie, 5 rue Blaise Pascal, F-67084 Strasbourg, France.)

Essentials of Molecular Photochemistry

A. GILBERT AND J.G. BAGGOTT

This text is aimed at final year undergraduates, beginning postgraduates and students requiring a fundamental knowledge of photochemical processes. The first two chapters, providing an introduction to the more physical and quantitative aspects of the subject, are followed by three chapters concerned with more advanced topics including the interaction between matter and radiation, molecular photophysics, and emission quenching. In view of the importance of photooxygenation processes, this is considered as a separate topic in the final chapter.

1990.

544 pages, 98 illustrations.

Cloth, £39.50. ISBN 0 632 02428 5

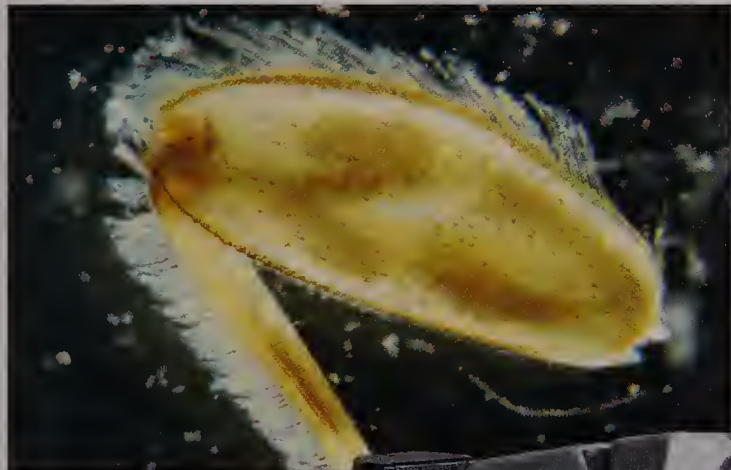
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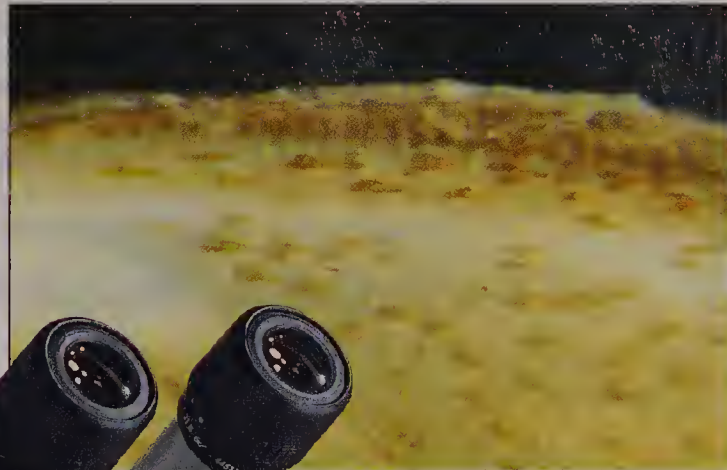
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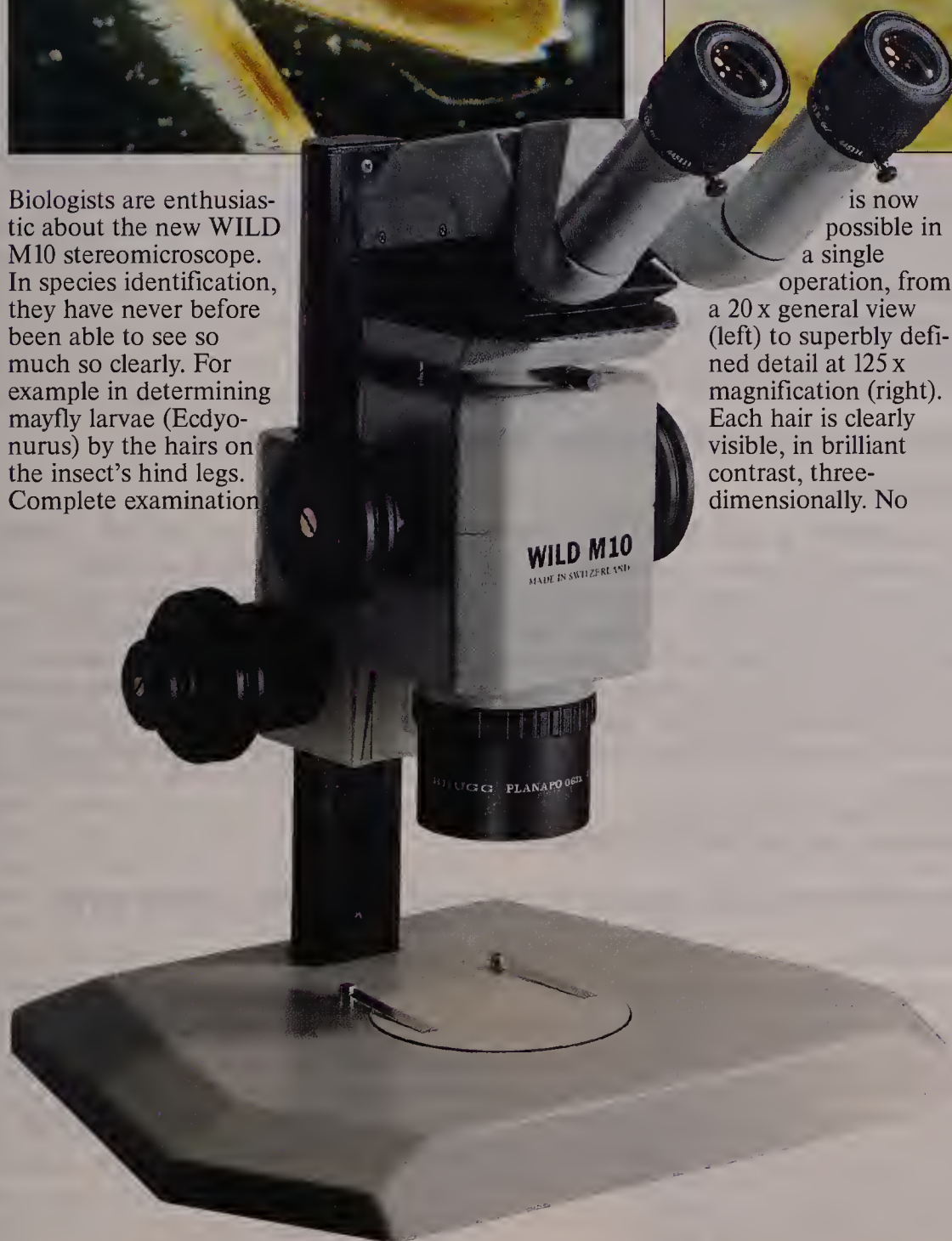


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Theory of Unimolecular and Recombination Reactions

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1990. 368 pages, 24 illustrations.

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Experimental Organic Chemistry: Principles and Practice

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This book is a completely modern and detailed undergraduate text containing a wealth of experiments, many new and original, designed around three-hour periods. A novel feature of the book is that experiments are classified according to levels of difficulty, starting with basic manipulative techniques and proceeding through increasingly complex experiments, this text can be used by chemistry majors or non-majors as desired.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 44 countries, each represented by a national organization, such as an academy of science or research council.

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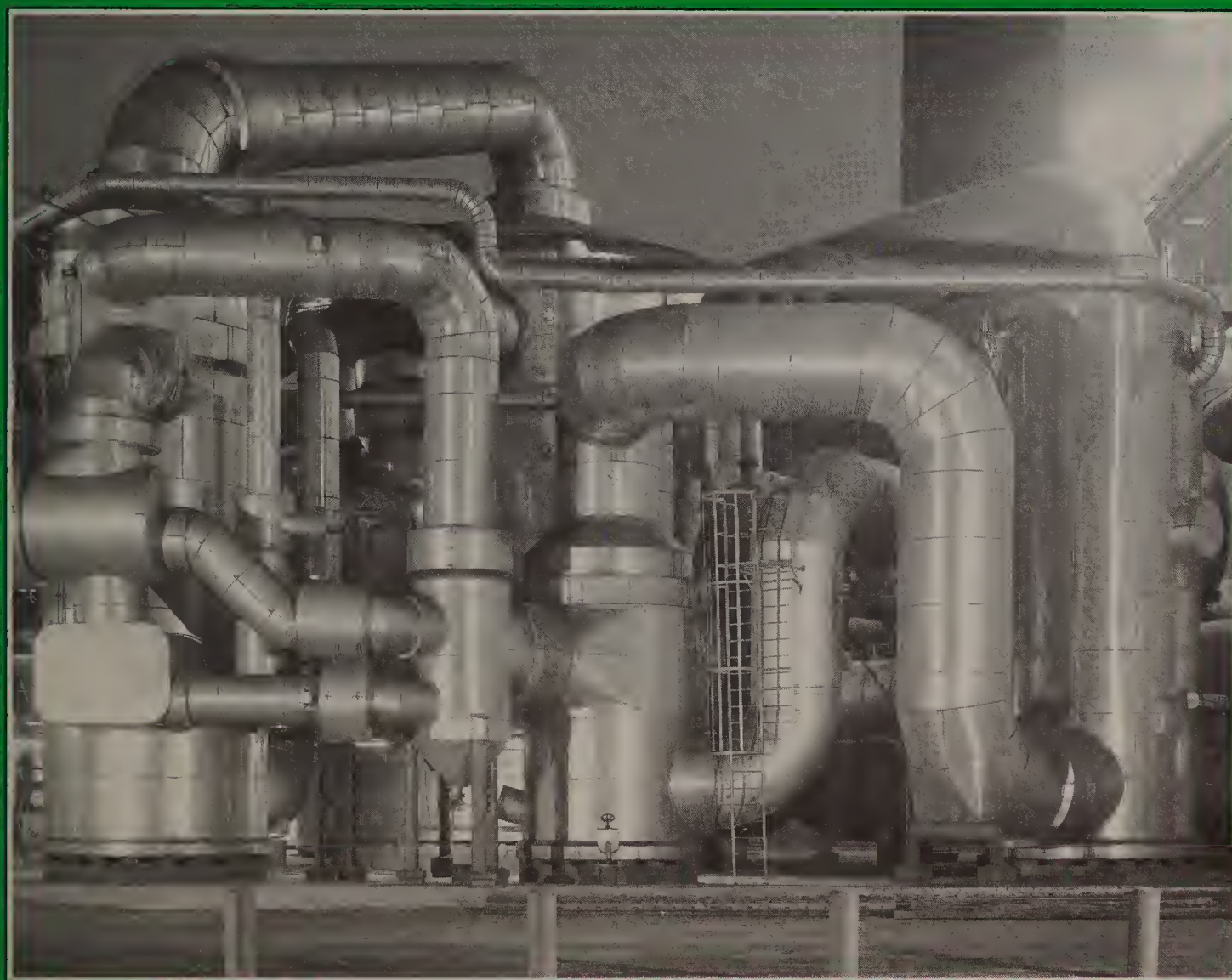


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Chemistry International

The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



1991, Vol. 13. No. 2 (March)

Blackwell Scientific Publications

Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

EDITOR: Michael Freemantle

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Front Cover: Sulfuric acid plant in the BASF Ludwigshafen works — FRG. (Photo courtesy BASF.)

Chemistry and the Environment:— World News and IUPAC Activities

Editorial

IUPAC activities

IUPAC activities in relation to the environment are moving forward on several fronts at the moment.

First of all, the Coordinating Committee on Chemistry and Environment Programme (CCCEP), which first met in Oxford in March 1990 (see *CI*, Vol. 12, No. 4, pp. 132–3) had another meeting in Triuggio, Milan in September 1990. At the meeting, CCCEP coordinators reported on progress of projects initiated earlier in the year. In particular, Dr Dieter Wyrsch, Chairman of the IUPAC Committee on Chemistry and Industry (COCI) reported on the successful 1st IUPAC Workshop on Safety in Chemical Production held in Basel, Switzerland, earlier in September (see pp. 50–60).

CCCEP also heard that the booklet *Chemistry and the Environment: The IUPAC Programme* had been well received and some 3000 copies had been distributed. In addition, the committee received two documents prepared by CCCEP Chief Coordinator Prof. Valentin Koptug entitled 'Compilative information on international organizations and programmes related to chemical and biochemical aspects of environmental problems' and 'Possible liaisons of the IUPAC Chemistry and the Environmental Programme with other international environmental programmes and proposals for new projects'.

The horizontal project 'Role of surface and colloid chemistry (including catalysis) in environmental protection' was also the subject of some attention at the CCCEP meeting. The bodies involved in this project are the Commission on Colloid and Surface Chemistry including Catalysis (I.6), the Commission on Microchemical Techniques and Trace Analysis (V.2) and the Limited Life Time Commission (LLTC) on Environmental Analytical Chemistry. The project is, as yet, in its formative stage.

Plans are well advanced for the World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change. This is the 7th in the series of IUPAC-sponsored conferences devoted to Chemical Research Applied to World Needs. CHEMRAWN VII will be held in Baltimore, Maryland, USA, 2–6 December 1991 (see pp. 78–9).

CHEMRAWN VIII is also in the planning stage. This will be a special conference devoted to chemical aspects of environmental problems of industry with emphasis on utilization of waste as a raw material. The conference may be held in 1992 or possibly later.



CHEMRAWN VIII will be devoted to chemical aspects of environmental problems of industry with emphasis on utilization of waste as a raw material.

IUPAC is maintaining strong links with other international organizations and agencies concerned with environmental issues. For example, in October 1990, Koptug and IUPAC Executive Secretary Dr Mo Williams met SCOPE-RADPATH representative Sir Frederick Warner (Chairman) and Dr Linda Appleby in London. SCOPE is the Scientific Committee on Problems of the Environment. It is one of the scientific committees of the International Council of Scientific Unions (ICSU). The SCOPE-RADPATH activity is concerned with environmental pathways of artificial radionuclides. This study evolved from the concerns raised by ENUWAR (Environmental Consequences of Nuclear War) during its final phase in 1988.

At the London meeting, IUPAC agreed to identify suitable experts to receive and review relevant sections of the draft SCOPE-RADPATH book on *Biogeochemical pathways of artificial radionuclides*. Following the meeting, Koptug travelled to Paris where he met SCOPE Executive Secretary Mme Veronique Plocq and also Mme Jacqueline

Aloisi de Lardereel of the United Nations Environment Programme — Industry and Environment Office (UNEP/IEO).

Wherever possible, *CI* has also been supporting the IUPAC Chemistry and the Environment Programme. For instance, this issue includes a report on the COCI meeting in Basel (see pp. 50–60). Recent issues of the magazine have also featured environmental items.

- The July 1990 issue ran reports on (a) Chemistry and the Environment: The IUPAC Programme and (b) Chemistry and the Environment: Stockholm 1989
- The September 1990 issue devoted almost four pages to various titles in the *Environmental health criteria* series published under the joint sponsorship of UNEP, the International Labour Organization (ILO) and the World Health Organization (WHO)
- An article by Bryant Rossiter on 'Chemistry: the mother science' and a review of SCOPE reports entitled 'Problems of the environment' appeared in the November 1990 issue
- The January 1991 issue carried an IUPAC workshop report on 'Uncertainties in atmospheric carbon dioxide' by Sjaak Slanina as well as a report of the CHEMRAWN Committee meeting held in Warsaw last year.

United Nations initiatives

CCCEP Chief Coordinator Valentin Koptug has recently written a letter to President Yves Jeannin, Secretary General Tom West, Executive Secretary Mo Williams and myself concerning a possible IUPAC response to new UN initiatives in relation to environmental problems.

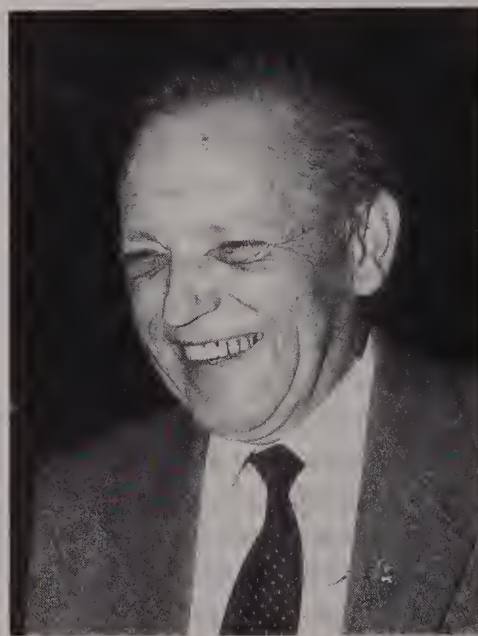
In his letter, Koptug points out that it is known that the UN is organizing a Special Conference on Global Problems of the Environment (Rio de Janeiro, Brazil, 1–12 June 1992) with the participation of heads of states. This high level conference will analyse the current situation in the world and approve general recommendations for:

- protection of the atmosphere (including global climate changes, ozone layer depletion, atmospheric transboundary transfer of pollutants);
- protection of terrestrial and oceanic resources;
- protection of biological diversity;
- conservation of drinking water resources;
- environmental safety of biotechnological production and applications;
- ecotoxicologically acceptable re-use of waste;
- safe treatment and discharge of toxic chemicals; and
- assessment of risk of environmental pollution and changes for human health.

Koptug states that it is clear that the period before the conference will be characterized by intensive activity of all international organizations and bodies involved in environmental problems, and that IUPAC should correlate its activity with a common movement towards the goals of the UN conference. This is important not only for the assessment of priorities in the Union's Chemistry and the Environment Programme, but also from a political point of view — IUPAC should seek to keep its leading role in the scientific world.

The role of *CI*

Koptug believes that, through *CI*, IUPAC should inform the international chemical community, including affiliates and members of IUPAC bodies, about the goals and most important aspects of the 1992 UN environmental conference as well as related activities of other international organizations. In this context, Koptug suggests that *CI* should open a special section on 'Chemistry and the Environment: World News and IUPAC Activities' (or similar title).



CCCEP Chief Coordinator Valentin Koptug was IUPAC President, 1987–9.

Koptug also mentions, in his letter, the possible publication of an IUPAC memorandum in response to the UN initiative to enhance environmental and other efforts as we approach the 21st Century. He proposes that this memorandum could be prepared as a declaration of IUPAC's intentions to support the UN concept of sustainable development and to stimulate the use of chemistry for an efficient response to world needs. The memorandum will also provide, he says, an opportunity to draw attention to forthcoming CHEMRAWN conferences, the restructuring of IUPAC and its implementation of its mission-oriented programme on Chemistry and the Environment as well as the scientific programme of the 34th IUPAC Congress to be held in Beijing, China in 1993.

The CCCEP Chief Coordinator further suggests that the new section in *CI* could publish regular

material on the current activities of various international organizations (such as SCOPE-ICSU, UNEP and WHO) connected with chemical aspects of environmental problems and the corresponding activities of IUPAC bodies.

In addition, he suggests that *CI* should invite chemists, particularly affiliates, to use the new section in *CI* as a 'post-box' for consultation on various questions related to chemical aspects of environmental problems, for indication of gaps in international efforts, and for the proposal of relevant projects. In this way, Koptug believes that it will be possible to introduce 'new blood' into the Affiliate Membership Programme, the health of which reflects the image of IUPAC.

Koptug's proposals for a new column in *CI* have been supported by IUPAC President Yves Jeannin but have yet to be discussed by the *CI* Editorial Advisory Board (*CI*-EAB) — which only meets every two years at the IUPAC general assemblies (the next one will be held in Hamburg in August this year).

When Koptug attended the CHEMRAWN Committee meeting in London last October, I had an opportunity to discuss these proposals with him. He was aware that *CI* already covers, quite extensively, environmental activities and publications of IUPAC and other international organizations such as SCOPE-ICSU, WHO and IPCS (International Programme on Chemical Safety). Some of this coverage in the current and recent issues of *CI* is detailed

above. Secretary General Tom West, who is *CI*-EAB Chairman, and I have also tried to encourage debate on environmental topics within the Affiliate Membership Programme. For example, the Affiliate Affairs column of the November 1989 issue of *CI* devoted four pages to affiliate discussion of such issues.

Even so, I agree with Koptug that there may be value in gathering all, or at least some, of these dispersed environmental items together under one heading — in the same way that we have gathered affiliate items together under the 'Affiliate Affairs' heading. However, this may mean that we will need to deplete other sections of the magazine — for example, the 'Publications' section.

Finally, Koptug and I discussed the resource — particularly staff — limitations of *CI*. I mentioned to him that, at the Boston and at the Lund General Assemblies, West and I reminded the *CI*-EAB that the sum total of the *CI* staff team of managers, editors, sub-editors, journalists, writers, news-gatherers, researchers, photographers, illustrators, cartoonists and so on based at the IUPAC Secretariat in Oxford is 0.5 persons (that is, half of me) together with the support of Secretarial Assistant Mary Patterson. *CI* thus has to rely heavily on the voluntary contributions and general support of the wider community of chemists within IUPAC and the Affiliate Membership Programme.

Michael Freemantle

News & Views

National subscriptions expected to rise

The Treasurer, Prof. Anders Björkman, has written to all National Adhering Organizations concerning an expected rise of total national subscription income for the biennium 1992/3. The following is the text of his letter:

In recent years forward planning within IUPAC has been invigorated and the conduct of financial matters is improved. Budgets are elaborated from careful considerations and a revised system of money allocation to the different activities has been agreed. This will ensure better utilization of IUPAC funding.

During the years 1984-89 the subscriptions were essentially unchanged and the derived income decreased considerably relative to income from other sources, mainly from publications and interests/dividends from assets. This other income has for several years given a bonus but is not likely to increase any

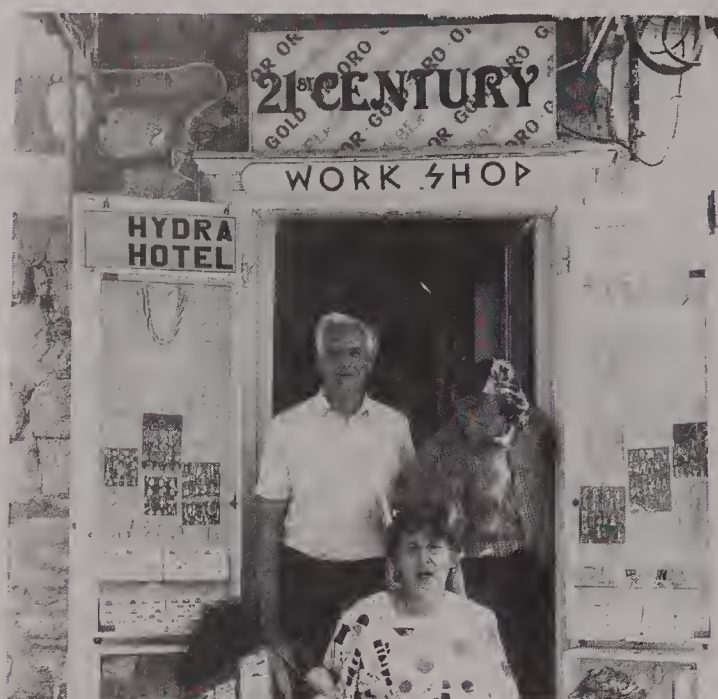
more, which is why subscriptions must be raised to a proper level.

This requisite was taken into account when the IUPAC Bureau met recently in Milan (Italy) and the budget preparation for 1992/93 was discussed. The 10% increase of subscriptions in the biennium 1990/91, approved by Council, was a first step to restore the proper level, but it has to be followed by another 5% increase in 1992/93.

A need for higher subscription income comes — in addition to the inflation — from the new activities, decided in 1989 at the General Assembly (Lund) as part of the restructuring endeavours. In the first place I wish to mention the mission-oriented programmes, the first one being 'Chemistry and the Environment'. Conversely, very few activities can safely be discontinued, but some rationalization is being considered.

Whether or not new developments should get further support financially is a matter for decision by Council in 1991. In order to facilitate your negotiations with financing authorities I felt it would be useful to give advanced notice of the Bureau's recommendation that subscriptions should be increased by 5% for the 1992/93 biennium.

Chemistry for the 21st Century?



An outpost for production of IUPAC monographs on *Chemistry for the 21st Century*? No, simply an unexpected location for the preparation of jewellery on the island of Hydra, Greece, visited by IUPAC Executive Secretary Mo Williams and Past-President Valentin Koptuyug, following the Executive Committee meeting at Athens in 1990. Mrs Irina Koptuyug is at the bottom of the picture with Mo Williams (under 'WORK').

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of all commission and committee chairpersons and secretaries and IUPAC officers were published in the November 1989 issue of *CI* (Vol. 11, No. 6, pp. 225–35). The IUPAC Secretariat has been notified recently of the following appointments, additions and changes.

Dr E. Dorn (Chairman, Commission on Agrochemicals). Hoechst AG, Analytisches Labor, G864, Postfach 800320, D(W)-6230 Frankfurt/Main 80, FRG. Tel: +49 (69) 305 4136. Telex: 41234-0 HO D. Fax: +49 (69) 303665/66.

Dr T. Kiss (Secretary, Commission on Equilibrium Data). Szervetlen és Analitikai Kémiai Tanszék, Kossuth Lajos Tudományegyetem, Egyetem tér 1,

H-4010 Decrecen, Hungary. Tel: +36 (52) 16666. Telex: 72200 UNIVK H.

Dr S. Heller (Chairman, Committee on Chemical Databases). USDA, ARS, BARC-W, Plant Genome Project, Bldg. 005, Beltsville, MD 20705-2350, USA. Tel: +1 (301) 344 2029. Fax: +1 (301) 344 5467. Telex: (23) 740 7878 SCIT UC.

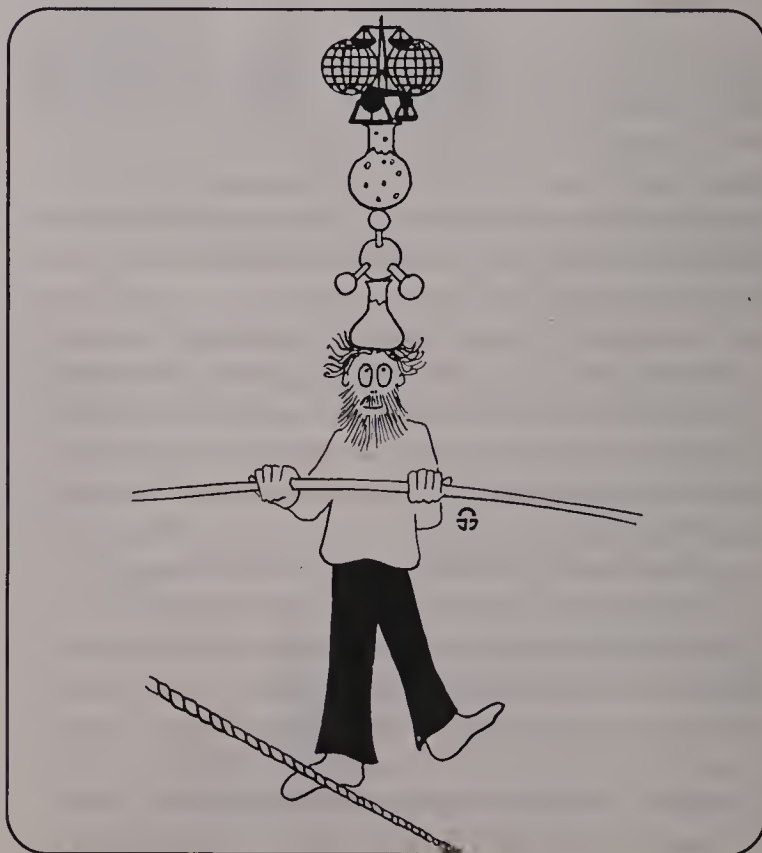
Prof. C. N. R. Rao (Chairman, Coordinating Committee on Chemistry and Advanced Materials Programme). Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore-560 012, India. Tel: +91 (812) 341690/344411. Telex: 08458349 IISC IN. Fax: +91 (812) 341683.

Democracy demands scientific literacy

Science isn't all bad news in the media after all. Stephen Pile (who is not a science writer) started an article about an International Science Festival held in Edinburgh in 1989 with the following two sentences: 'All right, you win. I give up: science is interesting.' The article, published in the British *Sunday Times* newspaper on 9th April 1989 was entitled 'Eureka: science is getting interesting'.

Towards the end of the article Pile concluded: '... with CFCs and ozone layers and greenhouse effects and salmonella we can no longer afford the luxury of ignoring science. Democracy demands scientific literacy.'

The same idea cropped up again — but in a different form — at the CHEMRAWN Committee meeting held in London on 14th October 1990. During discussions about the public image of chemistry, Alan Hayes, Secretary of the Committee suggested that 'scientific illiteracy is a threat to democracy'.



An Irish affiliate from South Africa visits Oxford

Eighty-year-old Irish affiliate William Stapleton from South Africa visited the IUPAC Secretariat in Oxford last September to purchase an IUPAC tie. He was in England paying a visit to his daughter and other members of his family who live near Oxford.

At the end of 1987, Stapleton retired as Senior Technican at the Council for Mineral Technology — the government mineral research establishment near Randburg which is about 16 kilometres north west of Johannesburg City. He had been working as a chemist in South Africa for 25 years. Prior to this, he had worked in England. He was born in Clonmel, Tipperary, Ireland.



William Stapleton.

Stapleton is a member of the South African Chemical Institute and became an affiliate member of IUPAC in 1987. On the affiliate registration form he expressed a specific interest in the work of the Commission of Solubility Data.

Confusion over conferences and congresses

Another embarrassing error has hit the pages of *CI* although, for once, your editor is not responsible. In my editorial on 'Fooling around at conferences and congresses' (see pages 1–2 of the January 1991 issue), someone completely fooled me by fooling around with the text AFTER I had read and corrected the page proofs. Somehow an unsolicited typesetting change sneaked into the final published version with the result that the term 'Conference' nonsensically appears twice in the alphabetical 'Guide to meetings nomenclature'. The second reference to 'Conference' should, in fact, have been listed as a 'Congress' as follows:

Conference. This is an appointed meeting for instruction or discussion. The emphasis is on conferring or possibly consultation. Thus, at a

scientific conference, scientists confer or consult with one another.

Congress. This is the act of getting together which explains the sexual connotations. IUPAC-sponsored congresses tend to be wide-ranging scientifically.

Typically, several sections or symposia on very distinct scientific topics are held in parallel sessions.

Blank pages

We have also been informed that some copies of the November 1990 issue included four blank pages instead of text. The printers inform me that very occasionally a printing machine drags through a second sheet of paper. The probability of this occurring is, I estimate, less than 1 in 30 000. If your copy does contain blank pages please write to The Editor at the IUPAC Secretariat and we will make sure you receive a replacement copy of the magazine.

Letter to the Editor

The Periodic Table

Sir,

The recent publication of the new edition of the IUPAC Red Book: *Nomenclature of inorganic chemistry: recommendations 1990* has focused attention once more on the different ways of writing the Periodic Table. Many of us will have been brought up with the old eight column table. The new Red Book recommends the 18 column table, but it presents all of the common alternative forms in an appendix.

I favour a completely different form of the table, presented long ago by Longuet-Higgins in a paper

in the *Journal of Chemical Education*, reproduced on the following page. Here the atoms are arranged in the form of an atomic orbital energy level diagram, which gives the same understanding of the structure of atoms as molecular orbital energy level diagrams give of the structure of molecules. In this table we imagine filling the orbitals with electrons from the bottom up, following the aufbau principle, as we build up the table. The ground state configuration of each atom is evident, and it is immediately apparent why the d electrons play no part in the first three periods and why the

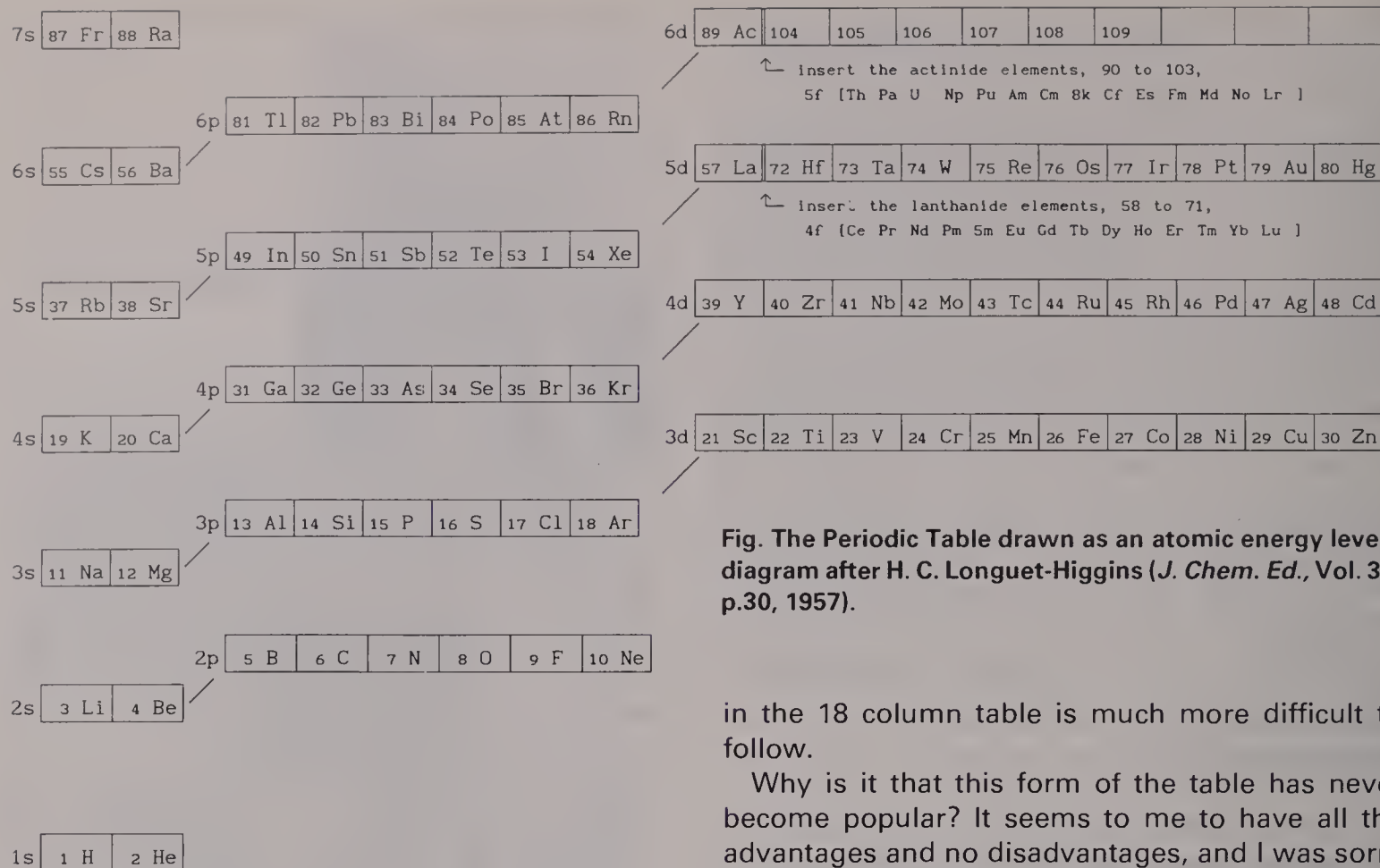


Fig. The Periodic Table drawn as an atomic energy level diagram after H. C. Longuet-Higgins (*J. Chem. Ed.*, Vol. 34, p.30, 1957).

approximate degeneracy of the 4s and 3d energy levels leads to complications in the electron configuration of the transition metals, and to the presence of low lying excited states (and coloured compounds). To a student who is not familiar with atomic structure, the logic of the large blank spaces

in the 18 column table is much more difficult to follow.

Why is it that this form of the table has never become popular? It seems to me to have all the advantages and no disadvantages, and I was sorry to find that it was not presented in the new Red Book. Is it perhaps that the Longuet-Higgins table has never been effectively publicised?

Ian Mills
Secretary, Commission 1.1
Department of Chemistry
University of Reading
Reading RG6 2AD, UK

Information for Affiliates

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International (CI)*, please indicate that the letter is 'Submitted for publication in *CI*'.

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2-3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF, UK
Tel: +44 (865) 747744; Fax: +44 (865) 747510;
Telex: 83220 IUPAC G

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC commissions. A full list of names and addresses of all commission officers for 1989-1991 was published on pages 225-35 of the November 1989 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.



Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually — but not always — announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal.

Reference materials in chemistry

A report by the IUPAC Subcommittee on Reference Materials in Chemistry published in the Commission and Committee News section of this issue

requests information from chemists who use, prepare or experience problems with reference materials. In particular, subcommittee chairman Stanley Rasberry is looking for contributions from those who are experienced in the use of reference materials. Details of a computer database on the availability of certified reference materials are also given in the report.

If you wish to contact the IUPAC Subcommittee on Reference Materials in Chemistry please write to either the chairman or secretary: (1) Stanley Rasberry (Chairman): Office of Standard Reference Materials, National Institute of Standards and Technology, Gaithersburg, MD 20899, USA. (2) Arthur Head (Secretary): 26 Little Bookham Street, Great Bookham, Leatherhead, Surrey KT23 3AQ, UK.

CHEMRAWN VII: Chemistry and the atmosphere

The World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change is the 7th in the series of IUPAC-sponsored conferences devoted to Chemical Research Applied to World Needs (CHEMRAWN) — see page 78 of this issue. It will be held in Baltimore, Maryland, USA, 2–6 December 1991.

The publicity leaflet announcing CHEMRAWN VII indicates that 'some financial assistance may become available to support travel to the conference for scientists from developing countries. Funds are also being raised to support a hands-on instrument workshop for scientists from developing countries which will be held immediately preceding or following CHEMRAWN VII.'

For further information contact: CHEMRAWN VII Secretariat, c/o American Chemical Society, Room 205, 1155, 16th Street, NW, Washington, DC 20036-4899, USA.

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available free of charge to affiliates and members of IUPAC's commissions and committee. The poster is printed in blue and black on a white background and is approximately 42 x 19 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Safety in chemical production

The 1st IUPAC Workshop on Safety in Chemical Production was held in Basel, Switzerland in September last year. Topics included safety assessment, risk reduction and safety education in the chemical industry. Case studies, including visits to chemical plants of IUPAC Company Associates CIBA-GEIGY, Hoffman-La Roche and Sandoz, were a unique feature of the workshop.

Introduction

The 1st IUPAC Workshop on Safety in Chemical Production took place at the Convention Center Basel (ewtcc), Switzerland from 9 to 13 September 1990. The chairman of the workshop was Dr Dieter Wyrsh who is also chairman of the IUPAC Committee on Chemistry and Industry (COCI) — the committee responsible for initiating and organizing the workshop.

Over 130 participants from 44 countries attended the workshop. These included 50 participants from 22 Third World Countries — 11 of whom were sponsored by the United Nations Industrial Development Organization (UNIDO) based in Vienna, Austria. Industry and universities were equally represented at the workshop with 56 participants from each. There were also seven participants from government and a few from insurance companies.

The first day of the workshop was based on invited lectures spanning three broad topics; Principles of safety assessment and risk reduction; Safety measures; Risk issues.

Identification of hazards

The session on 'Principles of safety assessment and risk reduction' included a lecture on 'Identification of hazards' by Dr V. Pilz (Bayer AG, Leverkusen, FRG). He pointed out that a hazard is the potential harm that a plant or process can cause to living organisms or to the environment.

In chemical processes, hazards generally arise from the reactive potentials of the substances used. The reactive potentials of chemicals can have a direct effect on living organisms. Consequently, the release of a substance of this type can represent a health hazard or damage the environment. A hazard may also occur indirectly if energy is released as the result of an undesired reaction. An explosion is an example of rapid and intense energy release.

In order to ensure that a process is safe, all possible hazards must be identified and assessed, and measures must be taken to counteract them. Hazard identification starts from the basic safety data for the materials, for example, flammability, explosibility and toxicity. Data characterizing these properties are established via tests.

One type of hazard, for instance a dangerous reaction with a high energy release rate, can be caused by various factors such as inappropriate materials or an incorrect temperature regime.



Basel hosted the 1st IUPAC Workshop on Safety in Chemical Production.



Workshop chairman Dr Dieter Wyrsh (left) and IUPAC President Yves Jeannin (right) who presented the greetings of the Union at the opening ceremony.

Hazard identification thus consists of establishing all the different ways in which a chemical process can reach a dangerous state, as identified by experimental investigations of the basic properties of the materials involved.

Proper hazard identification must therefore be based on knowledge of the properties of the materials, process characteristics (as shown in flow charts, and piping and instrumentation diagrams), process parameters (such as temperature, pressure, concentration, residence time, and flows of heat and mass), and plant design characteristics. Hazards can then be identified by a comparison of process data and possible excursions (or deviations) from these data with the danger spots determined by experiments.

Pilz stressed that a very systematic procedure is thus required. Hazard identification must be integrated into every stage of the development and design of a process from the laboratory to bench scale, and from basic design to detailed engineering.

Various problems are located at each stage, so hazard identification must focus on different aspects as appropriate. Each design and design stage may bring new hazards which it is necessary to look into. This may involve new experimental investigations and additional measures.

Hazard identification therefore has to be based on a stepwise, iterative procedure. It should not only include normal operation of the plant, but also deviations caused by disturbances, for example, interruptions in the energy supply and variations in input materials, and it should also include start-up, shut-down and maintenance procedures.

Finally, hazard identification should accompany the plant design process, becoming more and more detailed as this progresses. Clear and thorough documentation, which can be relied on later, is thus essential.

There are a variety of useful tools which aid systematic identification. Two examples are, elabo-

rate check-lists based on experience which outlines potential problem areas, and the HAZOP method, which uses guide words to identify problem areas and tables to document the findings.

Reduction of consequences

The second session of the first day of the workshop was devoted to 'Safety measures'. Three invited lecturers were presented in this session: Reduction of consequences (K. Eigenmann, Ciba-Geigy, Basel, Switzerland); Reduction of probability (R. Papp, Atochem, France); and Safety management (P. De voogd, Shell Int. Chemie Maatschappij, The Hague, The Netherlands).

Eigenmann reminded participants that the result of the previous steps of risk analysis — collection of basic data, definition of safe process conditions and identification of potentially hazardous deviations —



Entrance to ewtcc Convention Center in Basel.

is a list of hazards, which are evaluated with regard to probability of occurrence and severity of possible consequence. All these analyses are the basis for the actual risk reduction. Risk reduction without prior systematic analysis may be incomplete or incoherent.

In order to reduce risk, two principal routes are possible: reduction of possible consequences (or severity) and reduction of probability (or frequency). In a technical and operational sense the two dimensions or risk are quite different.

Risk reduction by reducing the possible consequences is usually an inherent improvement of a process or installation, whereas reduction of probability is often only effective as long as maintained and managed properly. Furthermore, emergency preparations must always be directed against the most severe possible consequences.

In the chemical industry, severity of consequences of risk depend primarily on the properties and amounts of the chemicals used and stored and on the characteristics of the reactions and processes. Therefore, reduction of consequences must be a design criterion in the early stages of process development. Key factors are:

- the synthesis route, which determines the chemicals and chemical reactions;
- the process technology, which influences process conditions and the hold up of chemicals and energy; and
- the material flow concept, which determines the necessary storage capacity for raw materials, intermediates and final products.

Minimization of the risk potential in the course of process development is the most powerful tool for reducing the consequences because it eliminates the source.

Many technical safety measures also aim at reducing the consequences but without reducing or eliminating the cause or potential, for example, in explosion protection; explosion venting, explosion

suppression or pressure-resistant construction. These leave the potential for energy release unchanged but reduce with high reliability the consequences of an explosion. This type of consequences reduction often requires constant attention and maintenance to keep it effective.

Reduction of consequences with all its advantages is not in all cases practically feasible. In such situations the powerful and sophisticated methods for improving reliability or reducing probability serve an important purpose.

Stewardship of chemical production risks

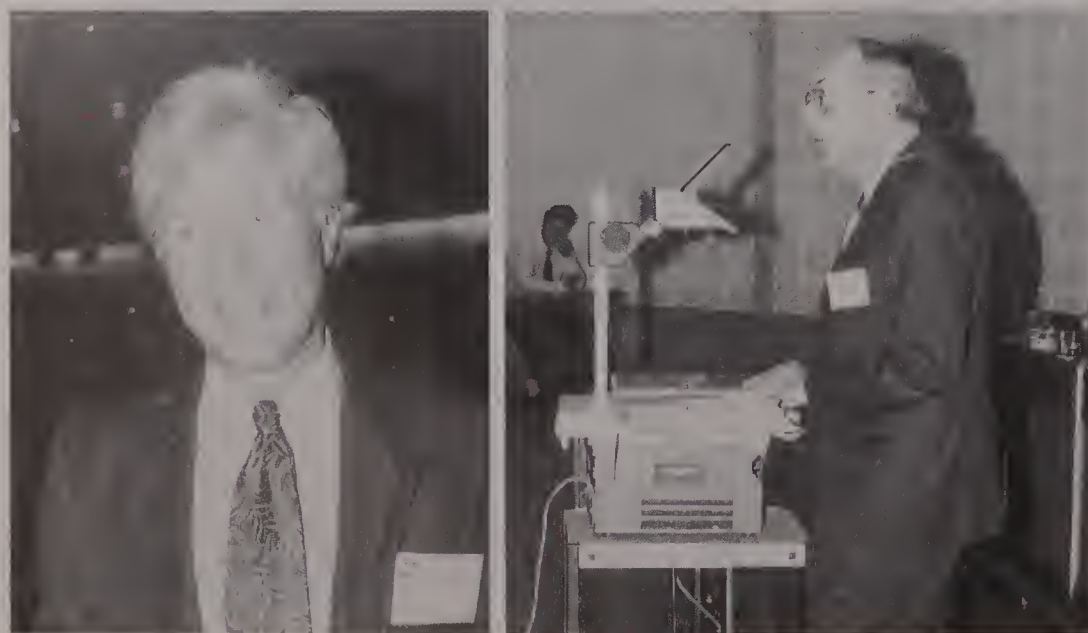
The final invited lecture of the first day of the workshop was presented by Prof. William Lowrance (The Rockefeller University, New York, USA) and was concerned with the stewardship of chemical production risks.

First, Lowrance defined a few risk basics. **Risk** is a compound estimate of likelihood and severity of harm. A key to dealing with risks is recognizing three separable modes of analysis and action.

- **Risk assessment:** *description* of the likelihood and severity of threat
- **Risk appraisal:** *evaluation* of the personal or societal burden from the risk, the costs required for protection, and the payback expected from risk-reduction investment
- **Risk response,** prescription of 'what to do about' the risk

These modes are distinguishable but interrelated. *Risk assessment* finds facts; *risk appraisal* weighs consequences of the facts in light of personal and social values; and *risk response* makes action decisions based on the facts, values and pragmatics.

Lowrance then considered boundaries. The outcome of all risk analyses are very sensitive to the boundaries adopted (such as which issues are considered) and the analytical assumptions incor-



Prof. William Lowrance (left) lectured on stewardship of chemical production risks. The first day of the workshop was chaired by F. Widmer (right).

porated. For chemical industries, typical bounding issues include: operations limits (for instance, are transport risks to be included?); misuse or abuse risk-causes; associated natural catastrophic risk-causes; routine chemical releases; wastes; catastrophic chemical releases; subjects at risk; environments at risk; social structures at risk; derivative effects; and time horizons.

The establishing of these boundaries and assumptions — which gives guidance to engineers and economists who perform the analyses, and which sets the ground for social debate over the specifics — clearly is an ethical and political matter. One of the principal values of regulatory and public review of analyses is debating and defining issues.

Lowrance pointed out that all of these matters are of concern not only to people affected directly, such as plant employees, and to 'the public' and its representatives and surrogates, but also to plant managers and government officials who must exercise civic duty. Concerned citizens may well be seeking, not detailed debate on specific questions, but general reassurance.

The broader questions in this context include the following.

- Generally, is the production activity worthwhile and responsible?
- Has every reasonably expectable precaution been taken to reduce the risks?
- Are the risks similar to other, familiar and routinely borne risks, or are they strange or exceptionally high?
- Are the people potentially at risk informed of the risks, and of how to take personal precautions? And have the people most at risk consented to bear the risks?
- Do those who bear the risks benefit from the activity that generates the risks (or willingly accept compensation from those who benefit)?
- Are the authorities in charge of managing the activity and controlling its risks competent, honest, well-intentioned, and trustworthy?
- Is demonstrable progress being made in managing the risks better?

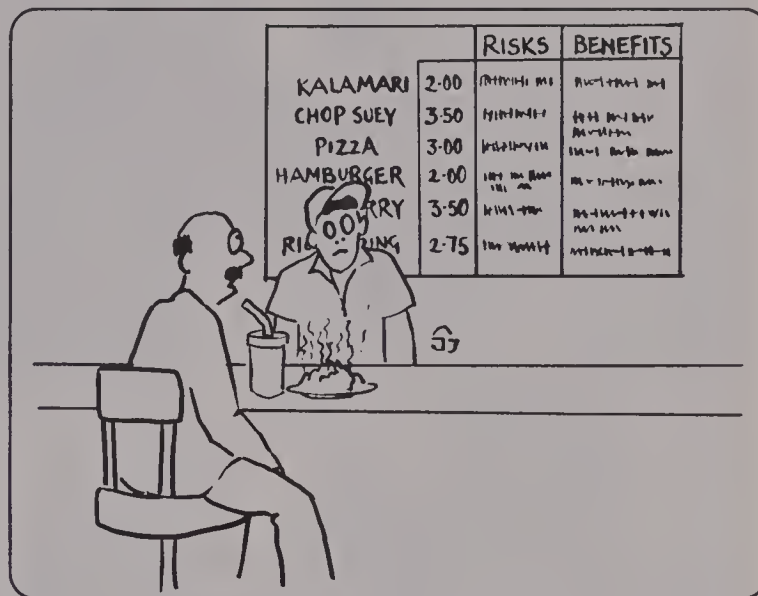
Many of these can be answered in common-sense language. Debates may centre around 'worthwhile-ness', 'reasonably expectable precaution', and informed consent.

Social justification of chemical production must centre on reducing the risks to very low levels *so as to accrue the societal benefits*. All risk-reduction efforts should be viewed as societal investments.

A major difficulty for chemical enterprises is that because most members of the public lack firsthand experience of primary production, they fail to appreciate the importance of producing the commodity, intermediate, and fine chemicals that are required for securing the agricultural, transpor-

tation, and other benefits of which they are avid consumers. Every possible effort should be made to remedy this unawareness.

Lowrance concluded by saying that these chemical issues are now public issues. In recent years, a number of very constructive social experiments and institutional reforms have been undertaken. The following practices can help foster an atmosphere of trust and responsible progress.



- Proceed openly, in consultation with affected communities
- 'Frame' the issues sensitively. Because the answers derive from very different sources, distinguish among elements of assessment, appraisal and response. Encourage the involved and affected parties to articulate their questions and concerns
- Seek agreement on procedures for resolving any contended technical issues
- Provide genuine opportunities for citizen participation. Recruit non-adversarial participants to 'fill the middle' between extreme views. Involve teachers, physicians, or other citizen experts in helping frame and interpret the issues.
- Involve civic groups, professional organizations, dispute-resolution organizations, or university groups, to provide expertise and broaden representation
- As improvements are made in managing risks, inform the public

Case studies

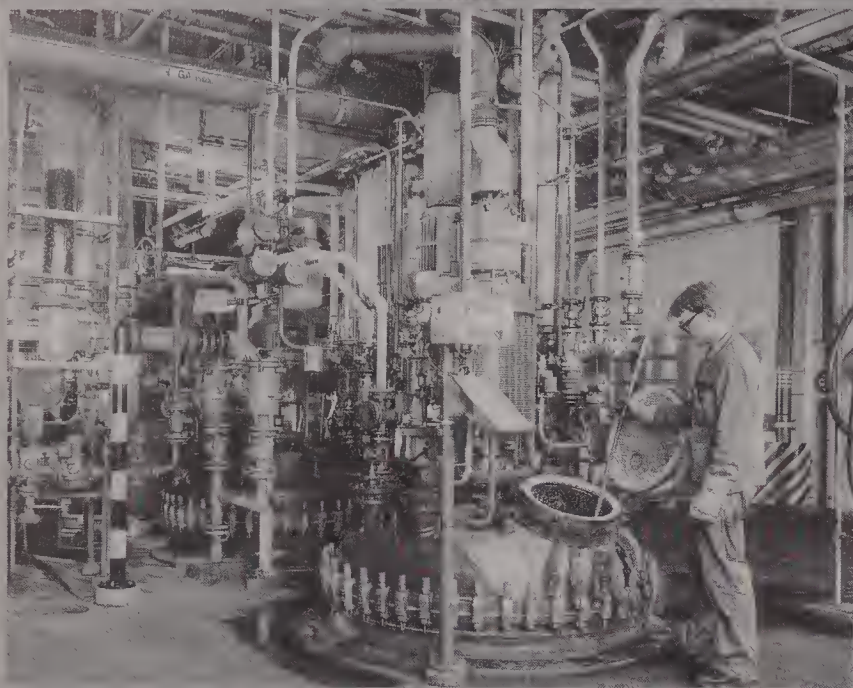
On the second day of the workshop, 12 detailed case studies, involving visits to modern chemical plants in the Basel area took place. Each case study group consisted of a small number of participants with a mentor from industry.

At F. Hoffman-La Roche AG, one group studied safety problems relating to catalytic hydrogenation. The process involved the transformation of the triple bond of C₃₀-dehydroaldehyde into an olefinic double bond by means of catalytic low-pressure

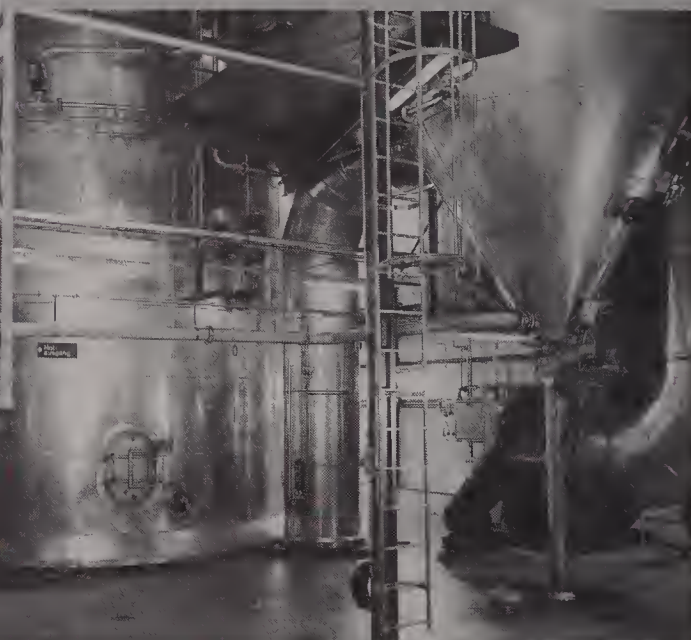
Group of participants at Sandoz Pharma AG.



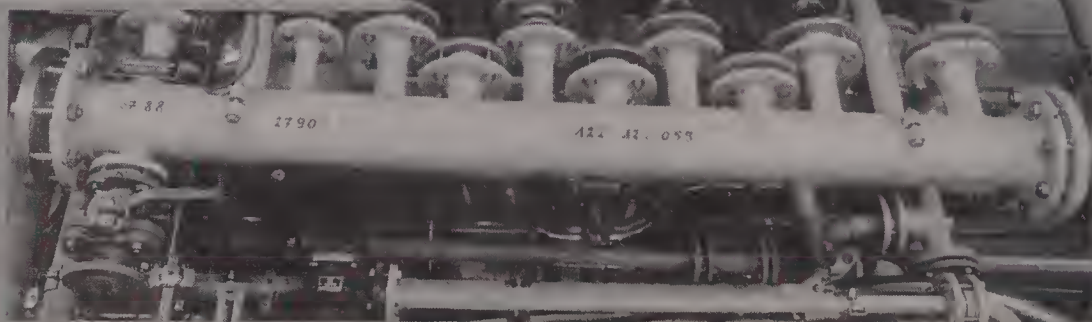
Batch production of marine-blue at Ciba-Geigy AG.



Spray-drier (Ciba-Geigy AG): subject of one of the case studies.



One group of participants (above) examined and assessed the risks associated with a sight-glass (right) used in a chemical exhaust air cleaning unit at F. Hoffman-La Roche AG.



hydrogenation in a 10 000 litre multipurpose hydrogenator. Fire and explosive hazards, inertization, gas exchange, handling of pyrophoric catalysts and process control by computer are major safety problems of this process. The group used check-lists for screening the process, equipment and environment for risks.

Another group used the 'Zurich Hazard Analysis' method for analysing risks on a nitration plant at Sandoz Products (Switzerland) AG. The plant produces several hundred tons of nitrated benzene-intermediates for various dyestuffs using concentrated sulfuric acid as solvent. Nitrations of organic materials are potentially dangerous processes due to the highly exothermic reactions that occur during the addition of mixed acid (50% nitric, 50% sulfuric acid). In order to achieve the goal of building the safest possible plant Sandoz decided to design a continuous production plant in the form of a cascade. Major safety problems considered by the workshop group were the exothermic reaction and the thermal stability of the reaction mass.

The manufacture of the dyestuff 'marine-blue' at Ciba-Geigy AG, was the topic of another case study. The workshop group analysed the process for risk using a systematic check-list method suitable for the investigation of batch processes.

In this process, 2-chloro-4,6-dinitroaniline, dissolved in sulfuric acid, is diazotized with nitrosyl sulfuric acid in a 2500 litre glass-lined vessel. Due to the very exothermic reaction and thermal instability of the diazo mass, special attention has to be given to the temperature control during the addition of the nitrosyl sulfuric acid. The group analysed the risks associated with the thermal stability of diazo mass and also the exothermic reaction.

Topics of the other case studies were: Catalytic hydrogenation of 2,4-dinitrochlorobenzene (Ciba-Geigy AG); Sulfonation of a nitro-aromatic compound (Ciba-Geigy AG); Explosion protection in a 'grinding unit' (Ciba-Geigy AG); Explosion protec-

tion of a spray drier in combination with a fluid bed drier (Ciba-Geigy AG); Fluid bed dryer in pharmaceutical production (F. Hoffman-La Roche AG); Waste water drains (Sandoz Pharma AG); Risk analysis of a high rack warehouse (Sandoz Produkte Schweiz AG); Chemical exhaust-air cleaning unit (F. Hoffman-La Roche AG); and Occupational hygiene (Sandoz Technologie AG).

Safety education

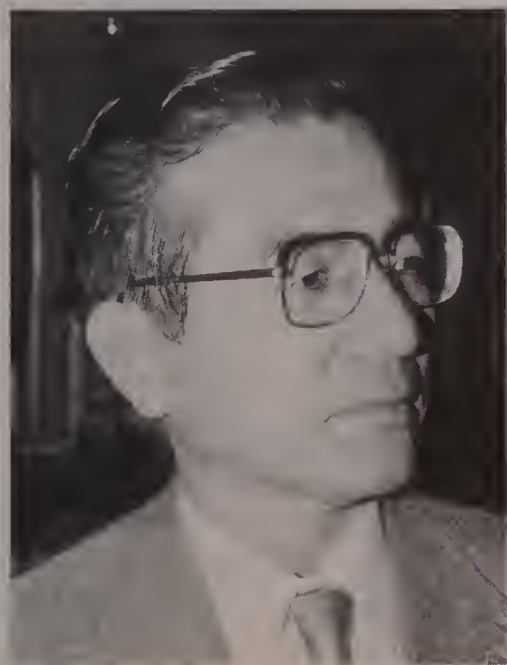
The third day of the workshop was devoted to lectures on safety education and panel sessions — two of which were also concerned with safety education. There was also an experimental lecture for students on 'static electricity' presented by Dr Martin Glor (Ciba-Geigy, Basel).

An invited lecture by Prof. Yoichi Uehara (Yokohama National University, Japan) was entitled 'Safety education in the Japanese chemical industry'. Uehara pointed out that, in Japan, education in industry is closely related to the school education system.

A young man who is a graduate from a high school and obtains employment in the chemical industry is sent to the plant workforce after being provided with fundamental knowledge on the company and chemical engineering. In this stage, he is provided with on-the-job training and starts a career as a fully fledged technician of the plant several years later.

Uehara's lecture referred to safety levels of Japanese chemical industry; plant organization; the basic policy on education of Japanese companies; the employment and education of workers; the roles operators are expected to play; education with simulators; and safety education in Japan in the future.

Following Uehara's lecture, Ada Wen-Shung Ma Lin (Industrial Technology Research Institute — ITRI, Taiwan) spoke about safety education in the



Prof. Yoichi Uehara (left) lectured on safety education in the Japanese chemical industry. **Dr Vilmos Friedrich (right)** from the Institute of Isotopes, Hungarian Academy of Sciences, Budapest, was a participant at the workshop.





Sue Cox (left) was one of the moderators on the 'Safety education in industry' panel. Ada Wen-Shung Ma Lin (centre) spoke about safety education in Taiwan. Dr B. Sugavanam (right), is Chief, Agro-Chemical Industries Unit, UNIDO — which supported participation of 11 Third World scientists at the workshop.

chemical industry in newly industrialized countries and in particular 'Present safety education in the chemical industry in Taiwan'.

She informed participants that, in order to launch an effective safety and health enforcement programme, the Council of Labor Affairs requested ITRI to develop a three stage training programme to upgrade industrial work-environment monitoring and analysis ability. The programme consists of the following steps:

1. to select six core laboratories to assist ITRI in developing 196 analytical methods;
2. to develop an interlaboratory comparative testing programme; and
3. to develop intensive training courses for sampling and analysis to upgrade the technical capability of industrial analytical personnel.

Within one year, promising results were obtained. The 'core' laboratories achieved improved standards and quality control.

Panel sessions

Nine panel sessions were held on the third day of the workshop. The sessions covered safety education; IUPAC activities on safety in chemical

production; powder explosion protection; static electricity; thermal analysis; industrial hygiene; hazard analysis; and inertization.

In the panel session on safety education in industry, Sue Cox (Loughborough University of Technology, UK) spoke about safety education and training in relation to the chemical industry. She first considered the context of such training in terms of organizational technological, economic, societal and legislative environments. Cox then discussed the process of training in terms of the 'training cycle'. She concluded by presenting a case study which not only illustrated the points raised but also provided an example of her work at Loughborough University of Technology.

In the same session, Dr T. Clégg (University of Manchester, UK) presented reviews of some of the major hazards associated with the storage of flammable liquids, where well-understood, costly accidents re-occur with depressing regularity. He discussed the value of regular, well-prepared safety education meetings against this background.

In the panel on 'Future priorities in IUPAC activities on safety in chemical production' Prof. Albert Fischli (Hoffman-La Roche, Basel) outlined the role of COCI within the Union — particularly in relation to safety in chemical production.



Panel session in progress.

Entrepreneurial responsibility

On the final day of the workshop, Dr Andres Leuenberger addressed participants on the topic of 'Safety in chemical production: part and parcel of entrepreneurial responsibility'. Leuenberger is Vice-Chairman of the board of Directors and Vice-Chairman of the Executive Committee of F. Hoffman-La Roche, AG. Since January 1991 he has been Chairman of the Swiss Society of Chemical Industries. The following is an edited version of his address.

Introduction

Recently, while reading a well-known Swiss newspaper, I came across an article entitled 'Environmental protection as a corporate goal'. 'Self evident', was my first reaction. But then it occurred to me that environmental protection does not — or not yet — hold universal importance as a goal. There are a large number of current examples to prove this, for example, in East European countries, where in certain respects attitudes have remained stuck in the Nineteenth Century. So, environmental protection is an important, but not a traditional goal of industry.

Rather, in the last few years, environmental protection has been showing up on the platforms of political parties. Nevertheless, most research-based companies have always taken their responsibilities in this area according to the progress of knowledge.

These efforts, however, arise not only from the responsibility a corporation feels towards its employees, the local population and the environment; they are also part of economic considerations which are not limited to short-term thinking. The integration of safety ecology into corporate policy is a rational process. It helps to ensure the qualitative growth of the organization and thus bringing about the achievement of its goals.

The responsibility of the businessman — in fact a compulsory counterpart of his freedom of action — is much broader and no doubt much more enduring than a set of relatively short-term goals. Correctly interpreted, entrepreneurial freedom always presupposes acceptance of responsibility for one's own behaviour. On the one hand, this includes the duty owed to shareholders because of their capital investment. On the other hand it also includes responsibility for employees' personal safety and job security, responsibility for ensuring an innovative product range and the duty, with respect to our environment, to keep all safety risks well under control. Responsible behaviour of course presupposes strategic thinking aimed at developing and maintaining long-term competitiveness and profit levels.

Safety and environmental consciousness on the part of the corporate manager are therefore a natural part of overall corporate planning. Only by including *all* relevant factors and considering *all* possible options can we achieve optimum safety and environmental protection with due heed to market realities. By exploiting modern technology and the possibilities now available for early risk identification to the full, industry is able to act even



Dr Andres Leuenberger and an aerial view of the Roche site where three of the workshop cases studies took place. (Photo courtesy of Roche.)

more quickly and effectively than legislation and regulatory limits require.

This does not mean that industry can constantly achieve the latest technical standards. Investments of some million Swiss Francs in order to prevent, for example, air pollution have to be planned carefully. The best available technology has to be evaluated and applied. This process needs time. And therefore, in legislation on environmental protection there is a need for constancy in standards and pollution targets. Any kind of moving targets must be rejected. At the moment of the investment decision, however, industry shows more flexibility. There are many examples in Swiss industry where new investments for safety and for environmental protection not only reached the actual governmental targets but using the available technology even went beyond.

Responsible corporate behaviour is not or not only idealism. By promoting a durable competitive edge, long-term profits and sustained corporate health, responsible conduct serves self-interested ends. I am also not forgetting the ethical responsibility of the employer. But it follows from this economic conviction that safety and environmental considerations must be built into corporate policy. The integration of responsible corporate behaviour finally into all the activities of our employees is the most effective for minimizing risks for the better use of natural resources.

Responsibility and responsible conduct cannot be expected from the private sector unless the community grants it a measure of autonomy. Without freedom of action, corporate obligations cannot begin to be discharged and opportunities cannot be seized. By that I do not mean to reject the need for government regulations. Effective government controls are needed in precisely those areas where market forces fail. So far as possible, however, government controls should be in line with free-market mechanisms.

The Swiss Chemicals Industry welcomes the joint establishment of national targets with the state. At

the same time, Swiss industry has to be allowed the greatest possible autonomy in the choice of the measures to achieve these targets.

Allow me to follow these general remarks by expanding on the notion of responsibility in the private sector. Responsibility, perceived as the complement of freedom of action, manifests itself among other characteristics in self-imposed guidelines. I have singled out three corporate duties for discussion:

- innovation,
- safety, and
- new technologies.

Innovation

Innovation is the task of identifying, developing and marketing products and services responding to the needs of today and of the future. This not only requires the establishment of tools within a company searching for novel products, for example, the active screening of possibilities offered by the current state of knowledge and technologies. It also requires willingness to take risks. However, the launch of an innovative product to answer a human need has to be carried out in a responsible manner.

Anxious, unconsidered rejection of new technologies prevents any critical and factual assessment and is a reflection of an attitude which prefers to abstain from solving problems. This attitude can often be observed in spite of clear evidence that new knowledge and technologies and any resulting new products cannot be suppressed. It applies, for example, to the broad need to develop new pharmaceutical products to provide cures for those two-thirds of all identified illnesses which even today remain incurable. Intensive research in the field of genetic information led to the development of gene technology. This, for example, opened the way to produce a large number of active substances using simple *E. coli* bacteria which we would not be able to produce by conventional processes. We still do not know for certain which of the hitherto incurable diseases will become treatable with the help of this new technology but in view of the tremendous opportunities offered we cannot afford an out-of-hand rejection of gene technology.

Anxiousness is only one of the reasons behind automatic rejection. It can also take place because of incorrect appreciation of the state of knowledge and misjudgement of intellectual capacities. The prudent approach is to form a critical opinion as to the potential risks. This should be done with a determination to find solutions to problems by means of open and factual discussions.

Safety

The IUPAC workshop has especially focused on the safety aspects of production. This involves safety



Safety and environmental considerations must be built into corporate policy. (Photo courtesy of Roche.)

during manufacturing, storage, transport, use and final disposal. It is clearly evident, that in the whole chain of responsibility there are also partners of industry. All of them, including the consumer, have to assume their share of responsibility.

A fine-tuned and internationally synchronized legal framework guaranteeing enough freedom of action can well serve as a basis for optimal safety in production, handling and disposal of new, innovative products. For the individual user it is essential to acquire the necessary knowledge for appropriate use and disposal.

We are talking primarily about chemical production during these days and the importance of safety in this area cannot be overemphasized. Entrepreneurship implies change, and change in chemical production must be implemented prudently with a wide ranging assessment which ensures that safety is maintained in new or modified products, during the development, construction and start-up process, and in the routine manufacturing of our products. no operation is exempt and no employee is exempt from compliance with and support of safety.

'As our operations and products become scientifically more complex, the burden of explanation and communication lies with us. Our ability to convey facts and support understanding will assist the public in making informed judgements of product or technology risks and benefits.'

Management's role is not limited to internal activities and efforts but also encompasses corporate responsibilities in the communities in which we live and work and in the physical environment where our products are used and our waste stream

disposed. This responsibility includes proactive steps to ensure physical safety as well as steps in education to support understanding. As our operations and products become scientifically more complex, the burden of explanation and communication lies with us. Our ability to convey facts and support understanding will assist the public in making informed judgements of product or technology risks and benefits.

Let me at this point comment briefly on what I see as the entrepreneurial opportunities in safety. Our safety experts, and many of you represent that group, must be entrepreneurial and forward thinking. While you deal with the issues and responsibilities of the day, your most important contribution is in anticipation and prevention. It is your responsibility to provide the proper check and balance that ensures that safety is an integral part of our products, designed into our plants and a priority component of our education and training programme. This requires constant vigilance and a longer term vision.

There can be no conflict between safety and entrepreneurship. The entrepreneur must always operate within the constraints of prudent safety guidelines. On the other hand, our corporate safety experts must support the internal entrepreneur in his search for new products, new processes and improved efficiency with innovative solutions to the safety issues which surface.

Democratic society confronted with new technologies

In democracies, where individuals wield substantial political power, governmental institutions, citizens and industry have to find a common denominator for their interests.

Most established technologies usually find broad acceptance. The scenario is different for new technologies. Large segments of society approach



Management's role also encompasses corporate responsibilities in the communities in which we live and work and in the physical environment where our products are used.

them with substantial doubt and question marks. For the individual, information which enables a personal assessment is not available or is difficult to understand. Experts explaining the benefits and risks act at the same time as opinion moulders. For the businessman, the life cycle and potential market penetration of a product or the impact of a technology have been scrutinized, and after launch market progress is only gradually revealed. For the authorities it is difficult to appreciate the impact of an innovative technology. Even more demanding is the assessment of the influence of a new technology, where no tangible products or services have yet emerged.

We can only enjoy the benefits of innovation if we are willing to develop a common assessment of its impact. So it is important that society improves the way it handles novel products and new technologies. A top priority is open dissemination of what is known about the benefits and risks, which really reaches the consumer.

With regard to the legal framework, internationally well-harmonized legislation could serve to channel ongoing efforts in a desired direction. Scientifically based and internationally accepted standards are certainly a great support for harmonization. Therefore industry welcomes the efforts of non-governmental institutions like IUPAC for their work in setting standards accepted all over the world.

Environmental protection and safety in chemical production, technical aspects

In the last 20 years, the chemical industry made extensive investments in facilities for environmental protection, with visible success. In the Federal Republic of Germany, for instance, industrial production has doubled in this period, but emissions, arising from production, dropped by 60–90%. The share of the total air emissions caused by chemical production in this country is now as low as 3%.

How was this achieved? Chemical production has mainly seen the application of so-called additive environmental protection. In other words, unwanted by-products are separated and eliminated. It will be rather difficult to abandon this procedure completely. The modern approach of integrated environmental protection is to use new production methods suppressing the generation of unwanted by-products. New working hypotheses have to be formulated and their technical practicability must be examined in order to find appropriate methods of integrated environmental protection.

An example from polymer chemistry can serve as illustration. Polypropylene was usually obtained by polymerization in a volatile solvent. Minute amounts of the solvent can be detected in the waste

air. An elimination of the residual quantities of solvent would have been laborious and expensive. Complete removal has proved to be unattainable. Therefore, additional environmental protection was not the answer. A new process had to be found. The research target was to find novel catalysts able to induce polymerization without solvents.



The modern approach of integrated environmental protection is to use new production methods suppressing the generation of unwanted by-products. (Photo courtesy of Roche.)

Now, modern methods use special catalysts exactly fitting the specific requirements of polypropylene production in the absence of a solvent. Searching for integrated environmental protection means finding a tailor-made pathway for each synthesis. There are not broadly applicable general solutions.

When we turn our attention to safety in chemical production a lot of questions could be addressed and answered during this workshop. If I was asked to pick out one issue from the multitude of topics discussed, my choice would be, minimization of risks. On the technical level, this goal can be approached by a systematic reduction of all risk factors, including human mistakes. This can only be achieved by permanent and continuing safety education.

If we ask for enough freedom of action to take the necessary measures, we simultaneously set ourselves an extremely ambitious challenge. Society requires increasingly interdisciplinary thinking, combining economical, technological and ecological considerations. Thus it is first up to us to formulate clear goals for *each* of these sectors and to achieve them. Prospective planning, early risk identification and taking the necessary measures, formulating goals and achieving them — this is *our* job. With better and well-considered risk-management we can demonstrate that we are willing to take risks, but that we also are conscious of our responsibilities and that we accept them.

Commission & Committee News

Reference materials in chemistry

It is over 3 years since the Subcommittee on Reference Materials in Chemistry summarized its aims and responsibilities in an article published in *CI* (Vol. 9, No. 4, p. 142, 1987). The most important of these were to provide a forum for the exchange of information on reference materials throughout IUPAC and to facilitate the exchange of information between the Union and the main international body in this field: the International Organization for Standardization (ISO) Council Committee on Reference Materials (REMCO).

Every IUPAC division is now represented on the subcommittee and we ask you to use this facility to provide us with information: you may have a need for reference materials that is not being met and which you would like brought to the notice of the world's producers; you may have prepared a reference material which could be made available to a wider circle of potential users; you may have experienced particular problems in using a reference material; please let us know.

We have not found it easy, even at general assemblies, to meet everybody with an interest in

reference materials. It is our intention, therefore, at the 36th IUPAC General Assembly in Hamburg, to have a stand near the registration area where we can provide and receive information, or just talk about matters of mutual interest.

The previous pattern of annual meetings of REMCO has changed somewhat during the past 3 years and there will have been only one meeting held between October 1987 and May 1991. The period has, however, seen the issue of ISO Guide 33 on 'Uses of certified reference materials' which is available from ISO or from national standards organizations. A revision of ISO Guide 30, 'Terms used in connection with reference materials' is in progress.

The subcommittee has undertaken to draft a tutorial article (for the Committee on Teaching of Chemistry) on the definitions and importance of uncertainty, precision, and accuracy in chemical measurement. Stanley Rasberry would be pleased to receive any contribution arising out of experience, especially related to the use of reference materials.

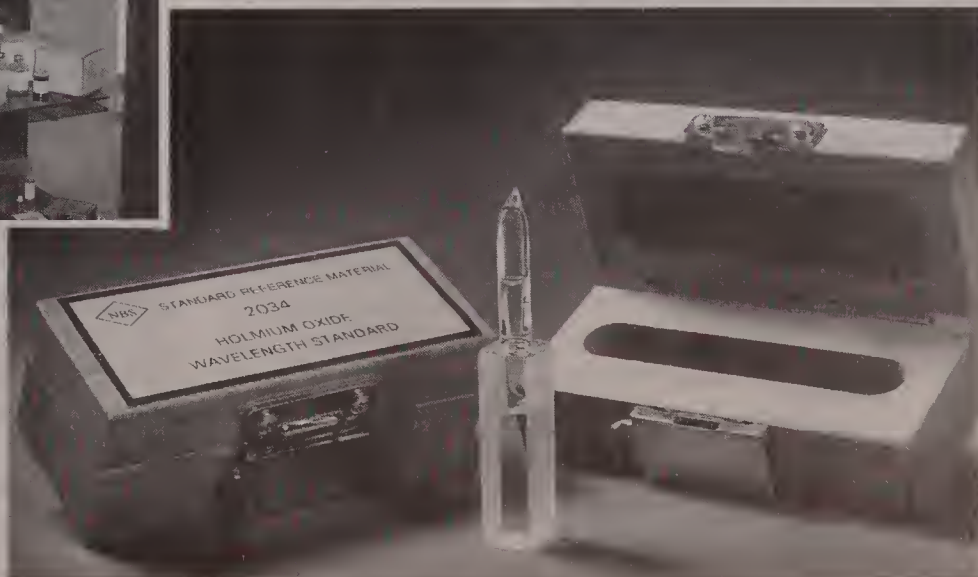
The computer databank containing information on the availability of certified reference materials (COMAR) has continued to grow and contains entries for approximately 4000 items. A council to coordinate the activities of seven coding centres has been formally constituted (see Box).

We look forward to hearing from many of you with an interest in reference materials and to meeting you in Hamburg.

A. J. Head



A reference material is defined as a material or substance one or more properties of which are sufficiently well established to be used for the calibration of apparatus, the assessment of a measurement method, or for assigning property values to materials. Stanley Rasberry (above) is Chairman of the Subcommittee on Reference Materials in Chemistry and an IUPAC affiliate.



Databank on Certified Reference Materials

Requests for information on how to make use of the computer databank on certified reference materials (COMAR) should be addressed to one of the coding centres or the Central Secretariat.

China

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No. 7 District 11
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Resource material for chemistry teaching

The Committee on Teaching of Chemistry (CTC) met in Moscow in September 1990. The highlight of the meeting was that several ideas discussed in earlier meetings about the need for high quality resource material for chemistry teachers, have now crystallized as manuscripts, including the following specific examples.

(1) *Environmental chemistry*. In keeping with IUPAC's new mission-oriented programme on 'Chemistry and the Environment', CTC launched an international initiative for developing teaching units in environmental chemistry.

Fifty-five participants from over 30 countries participated in a CTC/UNESCO-sponsored workshop held in December 1989 at the University of California in Berkeley, USA. The programme, organized by Prof. Marjorie Gardner, featured an innovative experiment in international instructional material development. The goal is to create teaching units on energy and environment which can be adapted to the curricular needs of different countries.

One such unit entitled 'The burning of fuels: how can chemistry help to minimize waste in materials and energy?', produced during the Berkeley workshop, has been adapted and pilot tested in 15 countries. As the reports presented at the CTC Moscow meeting highlighted the utility and popularity of such an approach, this unit will be published for wider dissemination.

(2) *Solid state chemistry*. At the Boston General Assembly, CTC agreed to collaborate with various divisions and commissions to produce teaching-oriented monographs in frontier and interdisciplinary areas.

The first such venture involved collaboration with the Commission on High Temperature and Solid State Chemistry (II.3). Professor Yu D. Tretyakov circulated a 200-page manuscript to committee members. This is now being reviewed by specialists with respect to its technical and pedagogic content.

(3) *Low-cost locally produced equipment*. The draft of a 350-page monograph was submitted by Professor Krishna Sané. The contents include step-by-step fabrication, use and maintenance of a pH meter, a colorimeter and a conductance meter designed under a CTC/UNESCO project at Delhi University. The monograph also includes results of several pure and applied chemistry experiments carried out by teachers using lowcost equipment. The monograph was scheduled for publication in November 1990.



The 1990 CTC meeting was held in Moscow (left). The meeting reviewed a CTC/UNESCO workshop on Chemistry and the Environment held at the University of California in Berkeley, USA in December 1989. The workshop programme was organized by Professor Marjorie Gardner (right).

(4) *Common misconceptions.* The committee examined a draft from Professor John Bradley dealing with some common misconceptions of several key chemical concepts. This will be circulated to specialists and teachers and comments discussed at the next CTC meeting.

(5) *Experiments in photochemistry.* A set of 24 experiments were received from the Commission on Photochemistry (III.3). CTC decided to have these tested by selected teachers. The results will be forwarded to the commission along with CTC's suggestions for publishing the material.

In view of rapid and encouraging progress in the collaborative projects, CTC has formulated some tentative guidelines for future work. These will be finalized after receiving comments from IUPAC officers and divisions and commissions.

Krishna Sané

Transport properties

The Subcommittee on Transport Properties of the Commission on Thermodynamics (I.2) met in Thessaloniki, Greece, 1–2 September 1990. Fifteen scientific presentations were made on specific topics related to the three ongoing projects of the subcommittee:

Standard reference data for the transport properties of fluids. Dr J. H. Dymond and Professor H. A. Oye outlined the results of their critical evaluation of viscosity data along the saturation line for a number of normal alkanes. They concluded that the available data did not justify a lower uncertainty than $\pm 0.5\%$. This was deemed inappropriate for standard reference data and the critical evaluation was to be continued using more rigorous criteria.

MIDAS databank of transport property data. The coverage within this databank of proposed environmentally friendly refrigerants was found to be rather limited. In part, this was attributed to the fact that much of the material available had not been published. In view of the likely urgent need for data it was proposed to contact the coordinators of a worldwide programme of measurements at the National Institute of Standards and Technology (USA) to obtain the latest data.

Transport properties data book. The subcommittee agreed that sufficient work had now been performed by the subcommittee to warrant serious consideration of the production of a book or series of books on transport property data. Professors M. J. Assael, C. A. Nieto de Castro and J. Millat agreed to serve on a small group to undertake a feasibility study of the project.

W. A. Wakeham

Environment: analysis of oils and fats

When the Commission on Oils, Fats, and Derivatives (VI.3) met in Montreux, Switzerland, 13–17 August 1990, it adopted a rapid method for the determination of benzo-a-pyrene (marker for the total amount of heavy polyaromatic hydrocarbons — PAHs) in edible oils. Coordinator Pim Hendrikse is preparing a report on the collaborative study and the method for publication in *PAC*.

Work on the detection of cross contamination of edible oils transported in bulk (contamination due to previous cargoes) will continue in the next period (a report from the coordinator Marshall Pike is expected at the next meeting). Work is also continuing on the next project dealing with an environmental problem: determination of residual



The Commission on Oils, Fats and Derivatives is investigating the contamination of edible oils shipped in bulk by chemical substances remaining in tanks from previous cargoes.

chlorinated hydrocarbons (solvents for oils and fats). A second collaborative study is planned for the next period by the coordinator Alain Karleskind.

The commission was successful in replacing carbon tetrachloride by cyclohexane in the standard method for the determination of unsaturation — the iodine value. Commission Chairman Dennis Pocklington was coordinator for this study which also serves to include precision data in older methods such as determination of iodine value, determination of peroxide value and determination of acidity.

An *ad-hoc* group coordinated by Patric Dysseler is studying methods for the determination of cadmium, arsenic, selenium and mercury in edible oils. Following discussions on the environmental aspects of analytical methods during last year's meeting at Lund, Gerhard Zwerenz presented a format for a questionnaire concerning the impact of chemicals on workers, water, air and soil. Commission members were asked to fill out the questionnaire for some 29 chemicals.

The commission decided to adopt a method for the determination of individual triglycerides important for the detection of adulteration of oils and fats. Coordinator François Mordret will prepare a report on the collaborative study and the HPLC method. A group coordinated by Gerd Ostermann has been set up to study methods for the detection of thermally treated oils.

The commission adopted the method for the determination of phosphorous in oils. The coordinator, Pim Hendrikse, is preparing a report on the collaborative study and the atomic absorption spectrometry method for publication in *PAC*. A working group on the 'Determination of lipid oxidation', coordinated by Herbert Wessels, is supporting the Commission on Food Chemistry (VI.1) by searching for analytical methods to determine auto-oxidation of lipids.

An *ad-hoc* group on the 'Determination of chlorophyll', coordinated by Jan Pokorý plans to

carry out a collaborative study using a spectrophotometric method and an HPLC method proposed by the Leatherhead Food Research Association.

Joyce Beare-Rogers reported progress with the study on the nomenclature of fatty acids which is being carried out in cooperation with the International Union of Nutritional Sciences.

The first supplement of the 7th edition of *Standard methods for the analysis of oils, fats and derivatives* will contain not less than 19 new methods and some revised methods in which toxic reagents or solvents have been replaced (amongst others, the method for the determination of the iodine value mentioned above).

Pim Hendrikse

Water chemistry and the environment

The Commission on Water Chemistry (VI.6) met at the Water Research Centre, Medmenham, UK in September last year to discuss the status of its present projects, to initiate new projects, and to start preparing a number of future activities. Also, some time was spent on considering the future composition of the commission.

Projects approaching completion

The coordinator of the project 'Review on waste water treatability tests', Mr L. Lindfors, has prepared a document on this topic. As it has become clear that standard methods on how to determine what kind of waste water treatment is to be used for a new chemical waste are scarce, the document will be updated for publication in *PAC* in the light of these results.

Following a draft paper prepared by Professor F. R. Malz on 'Organics and metals in sewage sludge', some additional input was provided by commission members. A summary of this input will be included in the draft paper which will be ready for publication by April 1991.

The projects 'Leaching tests to assess pollution hazards to ground water' and 'The use of QSARs (Quantitative Structure Activity Relationships) for predicting environmental process parameters' have resulted in draft documents which will be circulated amongst commission members for additional information. Final drafts of both documents are expected to be ready for publication by March 1991.

Also, it was decided that on 13 and 14 August 1991 at the next general assembly in Hamburg, a workshop will be organized on the behaviour of pesticides in water catchments. The aim of this workshop is to produce a book summarizing the state of the art on this subject. The first day is intended to deal with both testing procedures used for assessing the behaviour of pesticides in the environment and models used to predict the

leaching characteristics and run-off of pesticides (including validation). The second day is intended to give a review on practical experiences in a number of different countries.

Ongoing projects

The present work of the commission falls under three headings.

(1) A joint project with the International Association on Water Pollution Research and Control (IAWPRC) on 'The use of amount and concentration units'. The work on this project has been delayed somewhat and the termination of this project is now expected in 1993.

(2) A project on 'Environmental fact sheets' coordinated by Dr A. Dobbs. The intention of this project is to present strictly scientific statements on issues related to the environment and water. As it is the feeling of commission members that the statements that need to be made are too far reaching for the Water Chemistry Commission to proceed by itself, the Applied Chemistry Division will be contacted in order to get their view on the best way to proceed.

(3) A project on 'Priority pollutants'. The aim of this project is to establish the criteria that are being used in the different countries for setting up lists of priority pollutants. Lists obtained from several countries will be closely examined in order to find the similarities.



'Environment fact sheets' prepared by the Water Chemistry Commission will present strictly scientific statements on issues related to the environment and water.

Possible future projects

Several possible projects were discussed at the meeting. It was decided that activities will be initiated in the following fields.

(1) A joint project with the Commission on Atmospheric Chemistry.

- (2) A follow-up on the project on the use of QSARs for predicting environmental process parameters.
- (3) The quality control aspects of the use of immunoassays for the assessment of water quality.
- (4) The analysis of trace constituents in water.

Also, several other possible future projects were discussed at the meeting. Possible topics include:

- Water re-use: this subject is becoming more important without any standards being available at the moment;
- by-products of disinfection;
- recommendations on methods to prevent pollution of ground water: how to improve the management of ground water systems in order to prevent its pollution with chemicals; and
- expressions of standards for discharges: how do sewage plants operate; which variations are possible.

Willie Peijnenburg

COCI workshops on safety in chemical production

The IUPAC Committee on Chemistry and Industry met in Paris, France, 28–29 September 1990. The chairman, Dieter Wyrsh, welcomed IUPAC President Yves Jeannin as well as two observers from Beijing, China.

The committee heard a report on the 1st IUPAC Workshop on Safety in Chemical Production which took place in Basel, Switzerland, 9–13 September 1990. On the first day of the workshop, plenary lectures were presented, addressing the principles of safety assessment and risk reduction as well as overviews on safety management measures and basic issues such as perception and tolerance of risk by the public.

During the second day, visits were organized to operational plants. Integrated risk assessments were performed taking the multi-faceted approach of modern chemical production into account. The participants discussed the interdisciplinary efforts needed to allow safe production of chemicals. These discussions covered process research, engineering, safety assessment, automation, computer control and waste air/water treatment. All participants in the case studies received safety documentation on the assessed processes.

On the third day, the workshop discussed safety education at universities and safety training in industry. Case studies were prepared for use in courses. These will be published in the workshop proceedings.

On the final day, Dr A. F. Leuenberger (Member of the Executive Board of F. Hoffman-La Roche AG), Federal Counsellor Dr F. Cotti (Swiss Federal

Government) and Prof. Jeannin presented concluding addresses.

The committee had to vote on two excellently prepared submissions from Japan and the USA on the venue of the next workshop on safety in chemical production. It decided that the next workshop will take place in Japan in Spring 1993. The venue will be Yokohama. Case studies on the production of biotechnological materials will be included in the workshop. Later, COCI intends to organize similar workshops in developing countries. China/Beijing, China/Taiwan, Egypt and Saudi Arabia have all shown interest. Developing countries desiring to host such workshops are encouraged to enrol as COCI members.

COCI recommended that the Union should encourage activities on the use of computers in chemistry within all branches of the IUPAC family.

The committee showed strong interest in the interdisciplinary efforts pursued within the IUPAC coordinating committees. Representative COCI members have been appointed as liaisons to the already established programmes on 'Chemistry and the environment' and 'Chemistry and advanced materials'. COCI endorsed the view that industry representatives should also be assigned to all the nascent coordinating committees.



COCI Secretary Albert Fischli with colleague at F. Hoffman-La Roche AG, Basel.

Following some discussion, COCI decided to put the following topics on the agenda of its next meeting: (1) IUPAC guidelines on safety in chemical production; (2) Establishment of regional centres for safety education; and (3) Workshops on safety in biotechnological production.

Albert Fischli

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions will be published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports.

If you would like to comment on these provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of national/regional centres appeared in *CI*, Vol. 12, No. 6, p. 228, 1990.

Glossary of bioanalytical nomenclature

Many disciplines are involved in the practice of clinical laboratory medicine, with each having its own set of technical terminology. Consequently, the terminology used in the clinical laboratory is often vague, inexact, and in some cases, even in discord

with conventional and officially approved terminology. In order to help rectify this situation, a general set of bioanalytical definitions has been compiled and collated from documents from several national and international organizations with the emphasis on those prepared by IUPAC, the International Federation of Clinical Chemistry (IFCC) and the International Union of Biochemistry (IUB). References are included for each definition included.

This document includes sections on General Terminology, Body Fluids, Enzymology and Immunology. Other topics will be included in subsequent documents. It is hoped that this set of bioanalytical definitions will be useful to the practitioners of clinical chemistry and will foster improved communication and understanding between them.

Comments on the document are welcome and should be sent by 31 October 1991 to: Dr Carl A. Burtis, Oak Ridge National Laboratory, PO Box 2008, Bldg. 4500-N, MS-6194, Oak Ridge, Tennessee 37831, USA.

Nomenclature of kinetic methods of analysis

The report lists, in alphabetical order, names and definitions of 41 terms, most widely used in kinetic methods of analysis. These include kinetic, differential-kinetic, catalytic and enzymatic terms. They have been harmonized with other previously published IUPAC documents.

Comments on the document are welcome and should be sent by 31 October 1991 to: G. Svehla, Department of Chemistry, University College, Cork, Ireland.

Notations and conventions in molecular spectroscopy

The subcommittee on Notations and Conventions in Molecular Spectroscopy was set up by the Commission on Molecular Structure and Spectroscopy (I.5) to try to establish a recommended set of conventions and symbols from those that are in common use in the spectroscopic literature. Three parts have now been prepared.

Part 1 is entitled *General spectroscopic notation* and deals with quantum mechanics, quantum numbers (vibrational states, angular momentum

and energy levels), spectroscopic transitions, and miscellaneous notations (e.g. spectroscopic terms).

Part 2, entitled *Symmetry notation*, establishes the notations and conventions used for the description of symmetry in rigid molecules, using the Schoenflies notation. It deals firstly with symmetry operators of the molecular point groups (also drawing attention to the difference between symmetry operators and elements). The conventions and notations of the molecular point groups are then established, followed by those of the representatives of these groups as used in molecular spectroscopy.

Part 3, entitled *Permutation and permutation-inversion symmetry notation*, deals with symmetry notation referring to groups that involve nuclear permutations and inversion operations. The recommendations follow the notation of Bunker, and in particular the symmetry groups involved will be called 'molecular symmetry groups' after the work of Longuet-Higgins.

Comments on the documents are welcome and should be sent by 31 October 1991 to: Dr Joann F. Sullivan, Department of Chemistry, University of South Carolina, Columbia, SC 29208, USA.

Publications

A revolution in biotechnology

A revolution in biotechnology, edited by Jean L. Marx, is the first of a series of books on important scientific topics for the general reader that is being sponsored by the International Council of Scientific Unions (ICSU) — of which IUPAC is a member.

As John Kendrew, who was President of ICSU, points out in his forward, over recent years biotechnology has initiated a transformation of many parts of the chemical industry, of agriculture and of medicine — a transformation that has emerged from the laboratory into practical application with quite remarkable speed.

One of the oldest industries in the world, brewing, depends on a typical biotechnological process. The breeding of domesticated animals is biotechnology too, if we accept the usual definition of biotechnology as the exploitation — or domestication, depending on the point of view — of other living organisms for the benefit of man. The other organism may be a large mammal, like the cow or pig; a plant, such as wheat or the potato; a micro-organism, like the yeast used in brewing beer; or a bacterium, as in many of the processes described in this book.

In general, man is not satisfied with the productivity of other organisms in the wild state. So *breeding* is required to effect a permanent change in the hereditary make-up of the organism — an alteration in the genetic message it passes on to its offspring — to increase the output of the desired product, whether this be alcohol or protein or carbohydrate. Historically, breeding has been the limiting factor in improving biotechnology, because primitive methods, such as some described in the *Old Testament*, are slow and empirical and proceed by trial and error. Indeed, they have not been very much improved upon in principle even in modern times.

The revolution that gives this book its name originated in the discovery of radically new ways of altering the genetic make-up of micro-organisms in a *directed* manner. The promise for the future is that these methods can in practice, as well as in principle, be extended to higher organisms — to plants and animals. And this new power depends on the discoveries of molecular biology: of DNA as the material of heredity; of the genetic code; of the relation between genes and the proteins to which



In the last few years biotechnology has initiated a transformation of many parts of the chemical industry of agriculture and of medicine. (Photo courtesy Lilly Industries Ltd.)

they give rise; of methods of reading the genetic message by sequencing genes; and of the restriction enzymes with which it is possible to cut and splice together sections of DNA in a deliberate fashion. These and the many other elements that make up the subject known as molecular genetics now make it possible to breed micro-organisms to order instead of using the hit-or-miss methods of earlier times.

The result has been a vast increase in the potentialities of biotechnology, in effect transforming the whole nature of the subject with many new applications that are becoming important not only in advanced countries, but also in the developing world. Not surprisingly, these new potentials have brought with them new regulatory and ethical problems.

The new biotechnology is already beginning to affect our lives and in the future its influence will be profound. The purpose of this book is to illuminate the scientific background, to describe what has already been achieved, to discuss the ethical problems, and to suggest what the future is likely to hold.

Beginning with an introductory chapter which provides a background in the basic principles of heredity and gene structure and function, the book moves on to describe how micro-organisms and the biological catalysts (enzymes) can produce chemicals ranging from simple alcohols and sugars to much larger and more complicated molecules, such as antibiotics and proteins. The last major group of chapters in the book deals in detail with current and future applications of the new techniques to human health.

A revolution in biotechnology edited by Jean L. Marx was published by ICSU Press in collaboration with Cambridge University Press, Cambridge, UK, 1989. x + 127 pp. ISBN 0 521 32749 0. Price: GBP25.00/USD44.50.

Environmental Health Criteria

The *Environmental health criteria series* is published under the joint sponsorship of the United Nations Environment Programme (UNEP), the International Labour Organization (ILO) and the World Health Organization (WHO). There are now 101 titles in the series. Reports Nos 1–86 were reviewed in the September 1990 issue of *CI* (pages 197–201). Report No. 101 is reviewed below. The following are the titles of Reports Nos 87 to 100:

87. Allethrin
88. Polychlorinated dibenzo-*para*-dioxins and dibenzofurans
89. Formaldehyde
90. Dimethoate
91. Aldrin and dieldrin
92. Resmethrin
93. Chlorophenols
94. Permethrin
95. Fenvalerate
96. d-Phenothrin
97. Deltamethrin
98. Tetramethrin
99. Cyhalothrin
100. Vinylidene chloride

Methylmercury

Environmental Health Criteria, No. 101, Published by WHO, 1990, 144 pp. (English only), ISBN 92 4 156101 2. CHF16.00/USD12.80; in developing countries USD11.20,

This book evaluates the risks to adult and fetal health posed by exposure to compounds of monomethylmercury. In view of the irreversible neurological damage produced in severe cases of poisoning, the book makes a special effort to clarify the ways in which this highly mobile metal enters the food chain and to define the levels that constitute a risk to human health. Close to 400 recent investigations, including numerous clinical studies following outbreaks of poisoning, are critically assessed.

The book opens with information on the properties of methylmercury and advice on the most reliable procedures for the sampling of human indicator media and tissues. A chapter devoted to sources of human exposure concentrates on environmental release from man-made sources, including mining of mercury, combustion of fossil fuels, the smelting of metal sulfide ores, the production of cement, and refuse incineration. Estimated daily intakes in the general population are presented, in tabular form, for each of the three major forms of mercury present in the environment.

Noting that the general population is primarily exposed through the dietary intake of contaminated fish and fish products, the book gives particular

attention to the mechanisms by which methylmercury enters the food chain and is metabolized and transported to tissues in the human body.

The second half of the book evaluates the large number of experimental, epidemiological and clinical studies relevant to the assessment of health effects in humans. A review of studies in animals and in *in-vitro* test systems, conducted since 1976, documents the consistent neurotoxicity and fetotoxicity of methylmercury, providing further support to the mechanistic models used to evaluate data in humans.

Chapters devoted to effects in humans draw upon what has been learned from poisoning outbreaks in Minamata, Japan and in Iraq as well as from studies of populations consuming high quantities of fish in Canada and New Zealand. Effects on the mature organism and on developing tissues are considered separately. For adults, important features of methylmercury poisoning identified include a long latent period, highly localized damage to the brain, and the irreversibility of effects in severe cases due to the destruction of neuronal cells. The evaluation of effects on developing tissues draws upon the considerable amount of new data available on dose-response relationship, concluding that prenatal life is especially sensitive to the toxic effects of methylmercury.

The final chapter issues conclusions concerning levels of exposure and the associated risks to health in the general public, in populations consuming high quantities of fish, and in pregnant women. While the general public is determined to be a low risk of methylmercury poisoning, populations consuming high quantities of fish may attain a blood methylmercury level associated with a low risk of neurological damage to adults. In view of the particular sensitivity of the fetus to methylmercury, exposure during pregnancy is judged to carry a high risk of neurological disorder in the offspring.

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*.

July 1990 issue of *ISO Bulletin*

TC 45 ISO 2303: 1990	Rubber and rubber products Isoprene rubber (IR) — Non-oil-extended, solution-polymerized types — Evaluation procedure
TC 61 ISO 4900: 1990	Plastics Textile glass — Mats and fabrics — Determination of contact mouldability

TC 106 ISO 9333: 1990	Dentistry Dental brazing materials
TC 138 ISO 6993: 1990	Plastics pipes, fittings and valves for the transport of fluids Buried, high-impact poly(vinyl chloride) (PVC-HI) pipes for the supply of gaseous fuels — Specification
TC 147 ISO 6439: 1990	Water quality Water quality — Determination of phenol index — 4-Amino-antipyrine spectrometric methods are distillation
TC 172 ISO 9385: 1990	Optics and optical instruments Glass and glass ceramics — Knoop hardness test



September 1990 issues of *ISO Bulletin*

TC 20 ISO/TR 8647: 1990	Aircraft and space vehicles Environmental degradation of textiles used in air cargo restraint equipment
TC 34 ISO 7495: 1990	Agricultural food products Wheat flour — Determination of wet gluten content by mechanical means
TC 38 ISO 9862: 1990	Textiles Geotextiles — Sampling and preparation of test specimens
TC 45 IS 4675: 1990	Rubber and rubber products Rubber-or plastics-coated fabrics — Low-temperature blend test
TC91 ISO 8022: 1990	Surface active agents Surface active agents — Determination of wetting power by immersion
TC 94 ISO 6530: 1990	Personal safety — Protective clothing and equipment Protective clothing — Protection against liquid chemicals — Determination of resistance of materials to penetration by liquids
ISO 9185: 1990	Protective clothing — Assessment of resistance of materials to molten metal splash

TC 6 ISO 5350-2: 1990 ISO 9197-2: 1990	Paper board and pulps Pulps — Estimation of dirt and shives — Part 2: Bleached pulp Paper, board and pulps — Determination of water-soluble chlorides — Part 2: Method for high purity products	TC 119 ISO 4498-1: 1990	parenteral preparations Powder metallurgy Sintered metal materials, excluding hard metals — Determination of apparent hardness — Part 1: Materials of essentially uniform section hardness
TC 45 ISO 3858-1: 1990 ISO 3858-2: 1990	Rubber and rubber products Carbon black for use in the rubber industry — Determination of light transmittance of toluene extract — Part 1: Rapid method Carbon black for use in the rubber industry — Determination of light transmittance of toluene extract — Part 2: Method for product evaluation	TC 131 ISO 8778: 1990 TC 157 ISO 4074-1: 1990 ISO 4074-10: 1990	Fluid power systems Pneumatic fluid power — Standard reference atmosphere Mechanical contraceptives Rubber condoms — Part 1: Requirements — Condoms in consumer packages Rubber condoms — Part 10: Packaging and labelling — Condoms in consumer packages
TC 76 ISO 8871: 1990	Transfusion, infusion and injection equipment for medical use Elastomeric parts for aqueous	TC 180 ISO/TR 9901: 1990	Solar energy Solar energy — Field Pyranometers — Recommended practice for use

The Budapest Congress

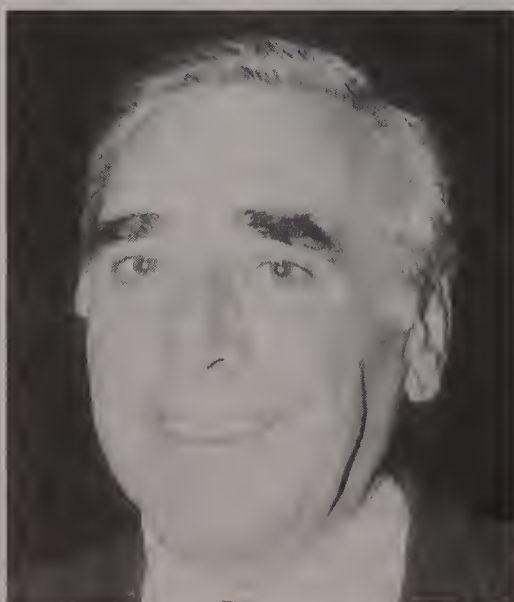
The 33rd IUPAC Congress will be held in Budapest, Hungary, from Saturday 17th to Thursday 22nd August 1991. Sessions will be devoted to analytical chemistry, inorganic and physical chemistry, electrochemistry, biochemistry, chemistry of fats, and polymer chemistry.

Introduction

The 33rd IUPAC Congress will be held at the Budapest Sports Palace from Saturday 17th to Thursday 22nd August 1991. The congress will provide a wide-ranging survey of the present state of knowledge and future trends in seven fields of chemistry. About 100 plenary and keynote lectures will be presented by prominent chemists invited from all over the world.

Participants are encouraged to contribute papers, which will be presented as posters. Social programmes are planned for active and accompanying participants and a technical exhibition will be held in the Budapest Sports Hall at the time of the congress.

The official language of the congress will be English. A translation service will not be available.



Ernő Pungor (left) is President of the Congress Coordination Committee and László Maros (right) is Secretary General of the committee.

The scientific programme

The scientific programme is devoted to seven fields of chemistry represented by the following sections.

1. *Perspectives of analytical chemistry*

Philosophical aspects of analytical chemistry; New directions in chromatography; New directions in spectroscopy; Possibilities of measurements of single atoms; Perspectives in chemometrics; Robotics in analytical chemistry; Environmental analysis; Trends in nuclear analytical chemistry; Perspectives of pharmaceutical and biomedical analysis; Analysis of giant molecules.



Section 1 includes a lecture on 'High decomposition and enrichment techniques for AAS and OES'. (Photo courtesy of Roche.)

2. *Inorganic and physical chemistry*

Dynamics of elementary reactions; Unimolecular reactions and energy transfer; Kinetics of fast reactions in solutions; Kinetics of radical reactions; New aspects of coordination chemistry in catalysis and kinetics; Laser studies; kinetics, dynamics and spectroscopy; solid state chemistry; Catalytic combustion; Environmental chemistry.

3. *Electrochemistry and electroanalysis*

New challenges in electrochemistry and electroanalysis; Electrochemical kinetics; Surface electrochemistry; Perspectives of electrochemical sensor research; Electrochemical energy sources.

4. *Chemistry and biochemistry of biologically active organic compounds*

Supermolecules; Chemistry of natural compounds; Peptides in drug research; Potential drugs; New trends in the chemistry of natural compounds; New aspects of coordination chemistry in biochemistry; Kinetics of biological reactions; Molecular design.

5. *Biotechnology*

Biochemical technology as a new basis for the development of the economy; Bioreactions and their optimization, downstream processes; Microbiological aspects of biotechnology; Environmental biotechnology.

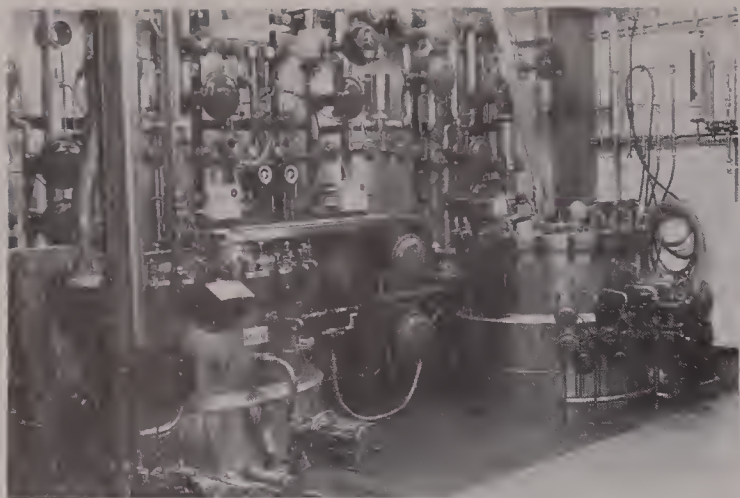
IUPAC Congresses

33rd	Budapest (Hungary)	1991
32nd	Stockholm (Sweden)	1989
31st	Sofia (Bulgaria)	1987
30th	Manchester (UK)	1985
29th	Cologne (FRG)	1983
28th	Vancouver (Canada)	1981
27th	Helsinki (Finland)	1979
26th	Tokyo (Japan)	1977
25th	Jerusalem (Israel)	1975
24th	Hamburg (FRG)	1973
23rd	Boston (USA)	1971
22nd	Sydney (Australia)	1969
21st	Prague (Czechoslovakia)	1967
20th	Moscow (USSR)	1965
19th	London (UK)	1963
18th	Montreal (Canada)	1961
17th	Munich (FRG)	1959
16th	Paris (France)	1957

15th	Lisbon (Portugal)	1956
14th	Zürich (Switzerland)	1955
13th	Uppsala (Sweden)	1953
12th	New York (USA)	1951
11th	London (UK)	1947
10th	Rome (Italy)	1938
9th	Madrid (Spain)	1934

IUPAC was formed in 1919. Before World War I, there was an International Association of Chemical Societies.

8th	Washington (USA)	1912
7th	London (UK)	1909
6th	Rome (Italy)	1906
5th	Berlin (Germany)	1903
4th	Paris (France)	1900
3rd	Vienna (Austria)	1898
2nd	Paris (France)	1896
1st	Brussels (Belgium)	1894



Two 1000 litre pilot fermenters: Section V of the congress is devoted to biotechnology and will include 11 keynote lectures. (Photo courtesy of Roche.)

6. Chemistry of fats

Fats and nutrition; Fats and cancers; New raw materials for the oil industry.

7. Polymeric chemistry

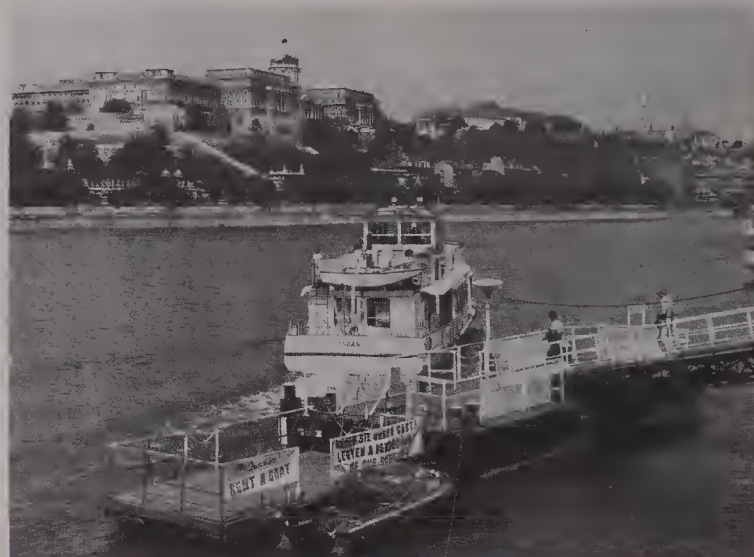
New directions of chemistry of polymers; New results in radical polymerization; Specialities of polymer degradation and advances in stabilization; Functional polymers (liquid crystalline polymers, reactive oligomers, thin layers and membranes, high strength and high temperature polymers); Structure and property correlations of industrial polymers; Development of structural characterization of traditional polymers; New methods of characterization and investigation of polymers; Colloid properties of polymers.

Plenary lectures

There will be eight plenary lectures including lectures by IUPAC Vice-President Prof. Allen Bard and two Nobel Laureates: Profs. John Polányi and Jean-Marie Lehn. The lectures are:

- Philosophical aspects of analytical chemistry (H. Malissa, Austria);

- Dynamics of elementary reactions (J. C. Polányi, Canada);
- Dynamics of vibrationally highly excited molecular states (J. Troe, FRG);
- New challenges in electrochemistry and electroanalysis (A. J. Bard, USA)
- Perspectives in supramolecular chemistry (J.-M. Lehn, France);
- New trends in measurement and control of biotechnological processes (K. Schügerl, FRG);
- Edible fats today and tomorrow (K. F. Gander, FRG); and
- Morphology of polymers (A. Keller, UK)



Budapest has been called 'The Queen of the Danube'.

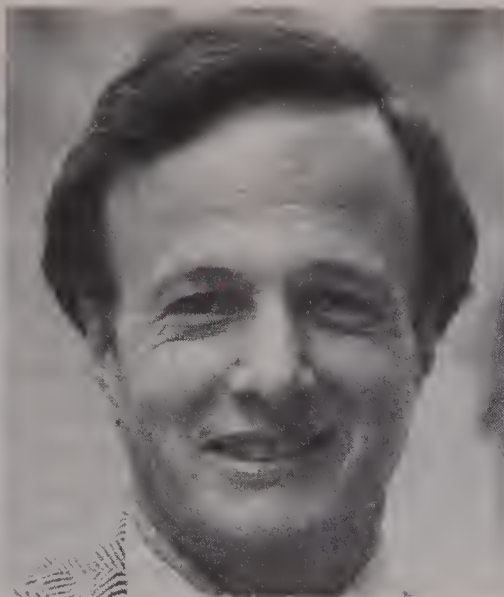
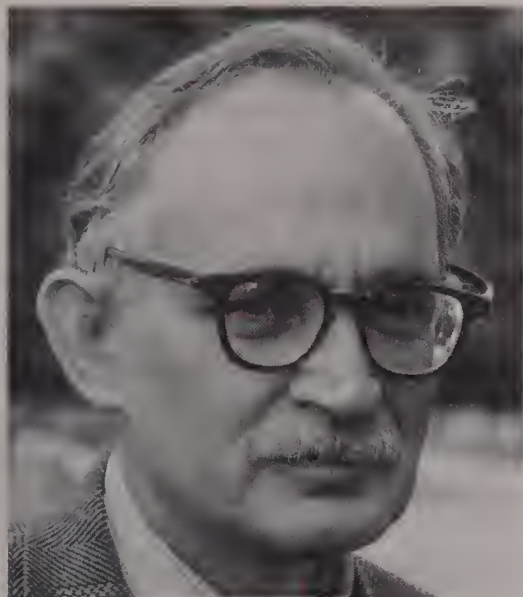
General information

The registration fees before/after 10 March 1991 are USD 280/350 for congress participants and USD 252/350 for IUPAC affiliates. The registration fee includes the book of abstracts, the final programme, a welcome reception at the Budapest Sports Hall, a formal reception, a cultural event and a sightseeing tour.

Hotel accommodation will be arranged by IBUSZ Hungarian Travel Company. Prices range per night from USD 70 to USD 180 for a single room and USD



Left: Pavel Kratochvíl (Czechoslovakia), who is chairman of the IUPAC Commission on Macromolecular Nomenclature, will present a lecture on 'Formation and structure of block and graft copolymer micelles in solution'. Right: IUPAC Bureau member Mikály Beck (Hungary) will lecture on 'Mechanistic and parametric conditions of exotic chemical kinetics. Why are there so few oscillatory reactions?'.



IUPAC Vice-President Allen Bard (left) will lecture on 'New challenges in electrochemistry and electroanalysis'. The title of the plenary lecture by Nobel Laureate John Polányi (right) is 'Dynamics of elementary reactions'.

90 to USD 220 for a double room. Accommodation in a student hostel is also available at USD 30–40 with a common shower on the floor but without breakfast.

Budapest is the capital of Hungary. A big metropolis, it treasures the old and embraces the new. It has been called 'The Queen of the Danube'. Interesting cultural and social programmes will be organized during the occasion.

The climate in August is usually mild, 18–25°C but

heavy showers may occur. Please do not forget your umbrella and swimming suit. Formal dress is not required.

Please address all correspondence concerning the congress to: 33rd IUPAC Congress, E. Pungor, c/o Hungarian Academy of Sciences, H-1111 Budapest, Gellért tér 4, Hungary. Tel: +36 (1) 664 705. Fax: + 36 (1) 853 493. Telex: 223628 ANAL H.

Conferences

Pharmaceutical and biomedical analysis *Boston, USA* 28 April–1 May 1991

IUPAC
SPONSORED

The 3rd International Symposium on Pharmaceutical and Biomedical Analysis (PBA '91) will be held at the Boston Park Plaza Hotel from Sunday 28th April to Wednesday 1st May 1991. This meeting follows the successful symposia held in Barcelona, Spain (September 1987) and in York, UK (April 1990).

The trans-Atlantic move is designed to encourage high-level scientific exchanges among analytical scientists from every corner of the world who are involved in the pharmaceutical and biomedical sciences. At the Boston symposium, all those involved in the analysis of drugs, related materials and endogenous compounds in any area of the pharmaceutical and biomedical sciences are cordially invited to participate.

The principal scientific themes of the Boston symposium include the following.

- Analytical aspects of biotechnology
- New developments in chromatographic methods

for the analysis of enantiomeric drugs

- Recent advances in drug analysis by high-resolution NMR and MS
- Current analytical issues in therapeutic drug monitoring and sports medicine
- Novel analytical methods to study drug absorption, metabolism, distribution and elimination
- Latest advances in detector technology, including UV, FL, EC and MS
- New approaches to sample handling and sample pre-treatment
- Novel techniques and applications in pharmaceutical and biomedical analysis (including quality control and quality assurance, drug formulation, assay validation, stability testing, bioanalysis, pharmacokinetics, biopharmaceutics, clinical chemistry, therapeutic drug monitoring, toxicology, drug metabolism and environmental control)

The meeting will consist of 20 invited keynote lectures, an opening plenary lecture by Prof. Barry L. Karger (Northeastern University, USA) on 'Critical issues in analytical biotechnology for the pharmaceutical industry' and a closing plenary lecture by Prof. Csába Harváth (Yale University, USA) on 'Preparative separations in pharmaceutical and biomedical analysis for the '90s'.



Boston will host the 3rd International Symposium on Pharmaceutical and Biomedical Analysis.

There will also be an exhibition of scientific instrumentation as well as a number of short courses on topical issues in the field.

The language of the symposium will be English and all papers presented will be considered for publication in a special symposium proceedings issues of the *Journal of Pharmaceutical and Biomedical Analysis*.

The registration fee will be USD 270 for scientific participants and USD 140 for students. A USD 25 discount off the full registration fee is available for affiliates. There will be a late registration fee of USD 50 after 29th March 1991. The fee for the workshops is USD 100.

For accommodation, rooms are available at the Boston Park Plaza Hotel at USD 115 single/USD 120 double per night.

The Boston Park Plaza Hotel and Towers, built in 1927 and recent totally renovated, is conveniently located in the heart of the historic Back Bay and overlooks the picturesque Public Gardens. The hotel is just a short walk from the boutiques and galleries of Newbury Street, the exclusive shops at Copley Place, the theatre district, the Prudential Center, Chinatown, the Hynes Convention Center and the Waterfront. The hotel, host to numerous scientific meetings, offers richly appointed functions rooms and a conference centre. There are many restaurants near and within the hotel.

**Spectroscopy
Bergen, Norway
9–14 June 1991**

IUPAC
SPONSORED

The 17th Colloquium Spectroscopicum Internationale (XXVII CSI), organized by the Norwegian Chemical Society, will take place in and around the Grieg Hall, in the city centre of Bergen. The University of Bergen auditoria (which will be used for the parallel sessions) and most of the hotels and sightseeing attractions are within walking distance of each other.

In a special plenary session Sir Alan Walsh (UK) will receive the first CSI-Award for major scientific contributions to analytical spectroscopy. Inaugural lectures will be presented by Prof. I. Sobelman (Moscow, USSR) and by Dr. B. E. Woodgate (NASA, Maryland, USA) on the topic 'Spectroscopy in space'.

To address the importance of spectroscopy in overcoming environmental problems and in protecting our environment, a series of invited lectures dealing with this subject will be presented. The final circular lists some 40 invited lectures including 'Is our knowledge of the inductively coupled plasma complete?' by Prof. Jean-Michel Mermet (France) who is chairman of the IUPAC Commission on Spectrochemical and other Optical Procedures for Analysis (V.4)



'Spectroscopy in space' is the title of one of the inaugural lectures at XXVII CSI. (Photo courtesy of NASA.)

Prof. M. Grasserbauer (Austria), who is a member of the Interdivisional Committee on Nomenclature and Symbols (IDCNS) and also chairman of the Steering Committee on Analytical Nomenclature, will present a lecture on 'Frontiers in surface and interface spectroscopy'. Commission V.4 titular member Prof. Bernhard Schrader (FRG) will lecture on 'New aspects of analytical Raman spectroscopy' and associate member Dr Ralph Sturgeon (Canada) on 'Chemical modification in electrothermal atomic absorption spectroscopy'.

Contributed papers will also be presented on the following topics.

1. *Basic theory and instrumentation of:* atomic spectroscopy (emission, absorption, fluorescence); molecular spectroscopy (UV, VIS, IR); X-ray spectroscopy; gamma spectrometry; mass spectrometry (inorganic and organic); electron spectroscopy; Raman spectroscopy; Mössbauer spectroscopy; nuclear magnetic resonance spectrometry; surface analysis and depth profiling; and photoacoustic spectroscopy.

2. *Applications of spectroscopy in the analysis of:* metals and alloys; geological materials; industrial products; biological samples; food and agricultural products; and reference materials.

Invited lectures will be published in special issues of *The Analyst* and the *Journal of Analytical Atomic Spectroscopy*. Submitted papers may be published as primary refereed papers.

A large area adjacent to the main auditorium and the poster area in Grieg Hall will be available for display of scientific equipment, analytical reagents and also books and journals.

In connection with XXVII CSI, the following satellite symposia are being organized:

- Graphite atomizer techniques in analytical spectroscopy (6–8 June, Lofthus, Norway);
- Characterization of oil components using spectroscopic methods (6–8 June, Øystese, Norway);
- Measurements of radionuclides after the Chernobyl accident (6–8 June, Bergen); and
- Speciation of elements in environmental and biological sciences (16–18 June, Loen, Norway).

The official languages of XXVII CSI will be English, French and German. No simultaneous translation will be provided.

The registration fees before/after 1st April are, for active participants NOK 2350/2600, and for IUPAC affiliates NOK 2100/NOK 2350. The fees include participation in the scientific programme, the opening programme, evening entertainment, admission to the CSI-Club and the abstracts.

Bergen (population 210 000) is the largest city on the west coast of Norway. From the time of its founding in 1070 to the middle ages, the city

developed into Norway's political and ecclesiastical centre. For some time, it was also the national capital. During the Hanseatic period, Bergen was a commercial city known throughout Europe.

Today, Bergen is a lively middle-sized city with good connections with the European countries. The city is a centre for trade, finance, communications, education and research and the location is an ideal point of departure to Norway's major tourist attractions: the fjords and the midnight sun.

On the west coast of Norway, the climate in the middle of June is pleasant with an average maximum temperature of 20°C. The average rainfall in June is 135mm.

Calorimetry and chemical thermodynamics *Moscow, USSR* 23–28 June 1991

IUPAC
SPONSORED

An International Symposium on Calorimetry and Chemical Thermodynamics will be held at Moscow State University, 23–28 June.

The scientific programme will include oral and poster communications as well as five plenary lectures and 14 invited lectures covering the following topics.

1. Thermodynamics of inorganic compounds.
2. Thermodynamics of organic compounds (including polymers).
3. Thermodynamics of solutions and multicomponent systems.
4. Thermodynamic models and databases.
5. Experimental techniques and data processing.
6. Thermodynamics of surface phenomena.

The following scientists have agreed to present plenary lectures:

- Chemical thermodynamics in the future development of chemistry including environmental problems (L. Brewer, USA);
- Chemistry and thermodynamics of refractory oxides (M. Shulz, USSR);
- The thermodynamics of ice and clutrat hydrates (H. Sugo, Japan);
- The thermodynamics of HTSC materials (G. Voronin, USSR); and
- Reference books and databases on chemical thermodynamics: the history, modern state and future (D. Wagman, USA).

The official language of the symposium will be English. The registration fee is USD 150.00. This fee includes participation in the scientific sessions, all printed materials and invitations to social events.

The weather in Moscow in June is warm although there may be some rain so a travel umbrella is recommended. Temperatures range from 15 to



In Bergen, Commission V.4 chairman Jean-Michel Mermet will ask the question 'Is our knowledge of the inductively coupled plasma complete?'.



A periodic table is draped above the main entrance of the Chemistry Department, Moscow State University, during an annual festival. The university is the venue of the 1991 International Symposium on Calorimetry and Chemical Thermodynamics. Prof. Lev Gurvich (right) is Chairman of the International Advisory Committee of the symposium.



25°C. A social programme including excursions, theatre and/or ballet has been arranged. An informal welcome party and excursions are included in the registration fee.

Surface and colloid science
Compiègne, France
7–12 July 1991

IUPAC
SPONSORED

The 7th International Conference on Surface and Colloid Science (7th ICSCS) will be organized and hosted by the Université de Technologie de Compiègne (UTC) from Sunday 7th to Friday 12th July. UTC Research Center and Technology Transfer Center facilities will be used as well as facilities at the nearby Cultural Center of the city.

The 7th ICSCS will consist of six plenary lectures and 12 symposia devoted to special topics. The plenary lectures are as follows:

- Short-range and adhesive forces across thin liquid films: role of molecular structure of the surface and liquid (J. Israelachvili, University of California at Santa-Barbara, USA);
- Long-range surface forces: the structure and dynamics of polymers at surfaces (J. Klein, Weizmann Institute of Science, Rehovot, Israel);
- Wetting films: stability and flow (N. Churaev, Academy of Sciences, Moscow, USSR);
- Adhesion: from chemistry to mechanics (P. G. De Gennes, Collège de France, Paris, France);
- Aggregation phenomena (D. Everett, University of Bristol, UK); and
- Molecular recognition at functional monolayers and multilayers: specific interaction, protein

crystallization and enzyme activity in model membranes (H. Ringsdorf, Johannes Gutenberg Universität, Mainz, FRG).

The 12 topic symposia are organized into three sections (A, B and C) each with keynote lectures.

A Molecules at interfaces

- A1 Surfactancy and supramolecular self-assemblies
- A2 Characterization and modification of surfaces
- A3 Wetting and adhesions
- A4 Chemical processes on solid surfaces

B Disperse systems

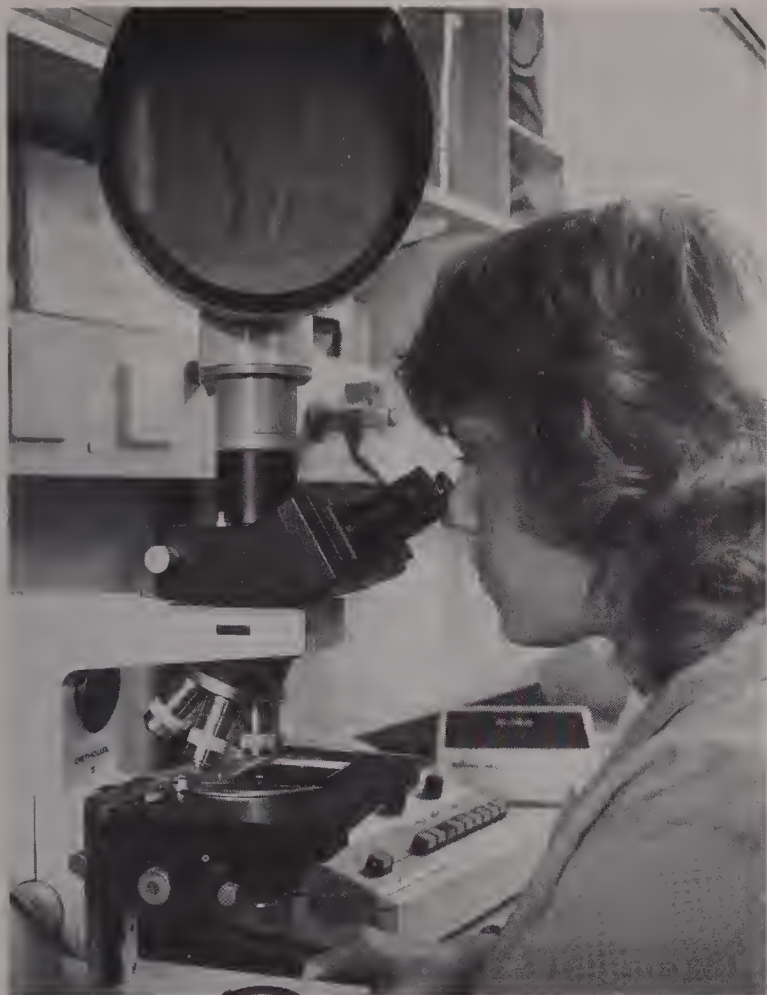
- B1 Nucleation phenomena
- B2 Aerosols
- B3 Preparation and characterization of colloidal particles
- B4 Emulsions and suspensions

C Biosystems

- C1 Biosurfactants
- C2 Food colloids
- C3 Biological macromolecules in microcompartmentalized media
- C4 Interactions between living systems and biomaterials

The plenary and keynote lectures will be published in *PAC*. A technical exhibition presenting scientific equipment, chemicals, technical know-how, books and journals will be arranged in connection with 7th ICSCS.

The normal registration fee will be around FRF 2200 for scientists belonging to universities and allied academic institutions and about FRF 3000 for scientists from industry and commerce. IUPAC affiliates are entitled to a 10% reduction. Fees will



The Symposium on Interactions between Living Systems and Biomaterials will be concerned with biomaterial biocompatibility; biomaterial chemical composition and surface characteristics, interfacial interactions between biomaterials and living tissues, and bioactive specific biomaterials mimicking constituents of living systems and related topics. (*Photo courtesy of Hoechst AG.*)

cover admission to all sessions, conference materials, including books of abstracts, coffee service, five lunches and free admission to the welcome reception and mixer and other social events — except for the official dinner.

Compiègne, the 'Cité Impériale', is a medium-sized picturesque, historic town (population about 65 000) on the banks of the River Oise 75 km from Paris.

Solution Chemistry *Linz, Austria* **14–19 July 1991**

IUPAC
SPONSORED

The 22nd International Conference on Solution Chemistry will be held in Linz, Austria, from 14 to 19 July 1991. The conference will bring together scientists interested in theoretical as well as applied aspects of solution chemistry.

There will be about 10 invited lectures. Contributed papers and posters are also welcome. The following subjects in aqueous, mixed and non-aqueous solvents will be covered:

Thermodynamics and kinetics;
Single ion properties;
Solution electrochemistry;
Spectroscopy, solubility and solvation;
Complex formation;
Solvent properties;
Biological aspects;
Solvent structures;
Quantum chemical approaches;
Computer simulations;
Applications.



Prof. G. Gritzner is Chairman of the Commission on Electrochemistry and also Chairman of the Local Organizing Committee of the 22nd International Conference on Solution Chemistry.

The official language of the conference will be English. No translation facilities will be provided.

The registration fee will be around USD 200 for active participants. The fee includes a Sunday evening get-together party, Wednesday afternoon excursion and conference proceedings. Three-star hotel accommodation with private shower and toilet will be available at about USD 35 for single and USD 70 for double rooms.

Linz is about half-way between Vienna and Salzburg. It is the capital of the province of Upper Austria and the third largest city in the country.

Rheology of polymer melts *Prague, Czechoslovakia* **15–18 July 1991**

IUPAC
SPONSORED

The 14th Discussion Conference on Rheology of Polymer Melts belongs to the series of Prague Meetings on Macromolecules. It will be held in the Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Prague.

The conference aims to bring together academic and industrial polymer and materials scientists and engineers concerned with deformation and flow of molten polymeric materials and to stimulate discussions about recent developments and future trends in this field.

Attention will be focused on theory, experiment and data evaluation and interrelation in rheological characterization of polymer blends and composites. Contributions covering the 'state-of-the-art' in molecular rheology, microrheology, phenomenological rheology as well as rheometry and rheology-based processing of molten polymeric materials will be greatly appreciated.

Twelve invited main lectures and about 12 invited special lectures are to be presented at the conference on the following topics:

1. New rheological models and theories;
2. Advanced rheometry and rheological characterization;
3. Progress in interrelating rheological data;
4. Complex deformation and flow; and
5. Application of rheological knowledge in processing.

A special discussion on the interconversion of linear and non-linear visco-elasticity data on polymer melts will be arranged.

Summaries of lectures and papers will appear in the programme booklet. Full texts of main lectures will be published in a special volume of *Die Makromolekulare Chemie, Macromolecular Symposia*.

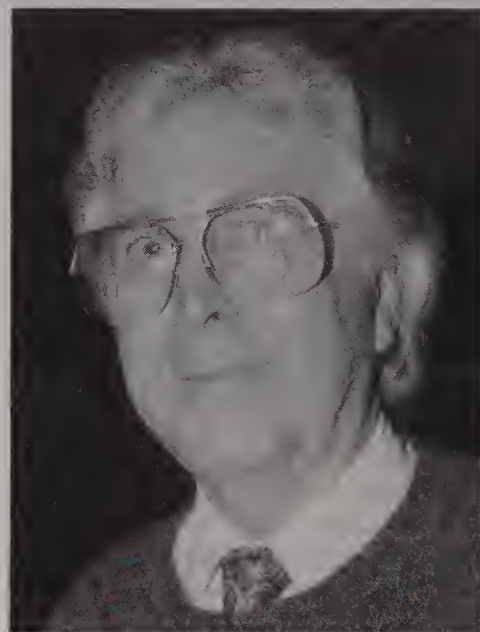
The registration fees (excluding accommodation) will be approximately CHF 220 for active participants.

Accommodation will be available in halls of residence.

CHEMRAWN VII Chemistry and the atmosphere Baltimore, USA 2-6 December 1991

IUPAC
SPONSORED

The World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change, is the 7th in the series of IUPAC-sponsored conferences devoted to Chemical Research Applied to World Needs (CHEMRAWN). CHEMRAWN VII will be held in Baltimore, Maryland, USA from 2 to 6 December 1991. It is co-sponsored by the American Chemical Society.



**Jack Calvert is
Chairman of the
CHEMRAWN VII
Program
Committee.**

The General Chairman of CHEMRAWN VII is Robert E. Sievers who is Director of the Cooperative Institute for Research in Environmental Sciences, University of Colorado. Jack G. Calvert (US National Center for Atmospheric Research, Boulder) is Chairman of the Program Committee. Calvert is also



The Vltava (Moldau) River, Prague.



CHEMRAWN VII is devoted to the chemistry of the atmosphere: its impact on global change.

Chairman of the IUPAC Committee on Atmospheric Chemistry.

The earth's atmosphere is a key component of our common globe. The responsibility to preserve the virtues and augment the bounties of the earth falls to all mankind. Chemistry can play a creative role in bringing about better environmental quality.

This conference will differ from others by endeavouring to assess the latest scientific understandings and translate these into policy recommendations that will alter, beneficially, the future actions of governments, corporations, and individuals.

Accordingly, the objectives of CHEMRAWN VII are to:

1. Define and put into perspective the prospects for future global change, its relationship to changes in atmospheric chemistry, and the far-reaching physical and socio-economic impacts of such changes.
2. Characterize present state of knowledge, identify knowledge gaps, and define research priorities with the aim of providing decision-makers in government, industries, academia, development and private volunteer organizations with the information necessary for effective government and private sector response.

3. Accelerate implementation of research priorities and recommendations by promoting international cooperation among the various interests of the global system.

4. Identify pragmatic ways to accommodate as well as abate global change.

Plenary sessions and contributed poster sessions will include the following subjects:

- Atmospheric chemistry and global change
- Stratospheric ozone depletion
- Methods of measurement of atmospheric trace species
- Global warming: the greenhouse effect
- Tropospheric build-up of oxidants
- Acid generation in the troposphere: acid rain

Some financial assistance may become available to support travel to the conference of scientists from developing countries. Funds are also being raised to support a hands-on instrument workshop for scientists from development countries which will be held immediately preceding or following CHEMRAWN VII.

Arrangements for discounted hotel rooms are being made. A social programme will be arranged for accompanying persons.

For further information please contact: CHEMRAWN VII Secretariat, c/o American Chemical Society, Room 205, 1155-16th Street, NW, Washington, D.C. 20036, USA.

Environmental biotechnology

An International Symposium on Environmental Biotechnology will be held in Ostend, Belgium, 22–25 April 1991. This will be the 66th event of the European Federation of Biotechnology — an Associated Organization of IUPAC. The symposium will be held under the auspices of the European Environmental Research Organization (EERO) and the Commission of the European Communities (CEC)

The meeting will bring together scientists and engineers to discuss biotechnological approaches for environmental protection and waste treatment and aims at an integration of fundamental, technological and socio-economic aspects of environmental biotechnology.

There will be sessions on: 1. Nitrogen transformations; 2. Biosensors; 3. Organochlorine compounds; 4. Sulfur and the environment; 5. Organic wastes; 6. Economic and legal aspects; 7. Hazardous wastes; 8. Aerobic wastewater treatment; 9. Heavy metals; 10. Socio-economic aspects and public awareness; 11. Anaerobic wastewater

treatment; 12. Soil depollution; 13. Film and floc; and 14. Off gases.

Enquiries should be directed to: ISEB '91, c/o TI-K VIV, Attn. Ms Rita Peys, Desguinlei 214, B-2018 Antwerpen, Belgium. Tel: +33 (3) 216 09 96. Fax: +32 (3) 216 06 89.

Polymer analysis and characterization

An International Symposium on Polymer Analysis and Characterization will take place in Baltimore

Inner Harbor, Maryland, 29–31 May 1991. This 3-day meeting will consist of poster sessions, invited lectures, round-table discussions and information exchange on recent advances in polymer characterization approaches, techniques and applications.

Following this meeting a 2-day short course will be held from 1 to 2 June 1991. This will cover major polymer characterization techniques and methods.

For further information and registration forms, please contact: Judith A. Watson, Professional Association Management, 750 Audubon, East Lansing, Michigan 48823, USA. Tel: +1 (517) 332-3667.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1991

Organic chemistry: technological perspectives

15–19 April. 2nd International Symposium 'Organic Chemistry: Technological Perspectives'. Baden-Baden, FRG. (Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D(W)-6000 Frankfurt/Main 90, FRG.)

Pharmaceutical and biomedical analysis

28 April–1 May. 3rd International Symposium on Pharmaceutical and Biomedical Analysis. Boston, MA, USA. (Ms Shirley Schlessinger, Symposium Manager, PBA '91, Suite 1015, 400 East Randolph Street, Chicago, Illinois, USA. Tel. +1 (312) 527–2011. Fax. +1 (312) 527–3437.)

Vapor–liquid equilibrium

13–17 May. 6th International Workshop on Vapor–Liquid Equilibrium in 1/Alkanol + *n*-Alkane Mixtures. Liblice, Czechoslovakia. (Prof. R. Holub, Vysoká Skola Chemicko-Technologicka, Katedra Fyzikalni Chemie, Suchbatarova 5, 166–28 Prague, Czechoslovakia.)

Spectroscopy

9–14 June. 17th Colloquium Spectroscopicum Internationale. Bergen, Norway. (17th Colloquium Spectroscopicum Internationale, HSD Congress — Conference, PO Box 1721 Nordnes, N-5024 Bergen, Norway.)

Solution properties of modified polymers

10–14 June. 8th Bratislava International Conference on Solution Properties of Modified Polymers. Tatranska Lomnica, High Tatras, Czechoslovakia. (Dr J. Barton, Polymer Institute, Slovak Academy of Sciences, 842–36 Bratislava, Czechoslovakia.)

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than 3 months in advance. If a visa is not granted 1 month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

In the case of the 32nd IUPAC Congress (Stockholm, Sweden: 2–7 August 1989), it was observed that the time for treating visa applications in Sweden may be as long as 5–6 weeks. To this must be added the time for handling the applications at the Swedish Embassy in the various countries of the intending participants. This confirms the need for applications to be made not less than 3 months in advance.

Calorimetry and chemical thermodynamics

24–28 June. International Symposium on Calorimetry and Chemical Thermodynamics. Moscow, USSR.

(Prof. L. V. Gurvich, Thermo-center of the USSR Academy of Sciences, IVTAN, Izorskaya St. 13/19, Moscow 127412, USSR.)

Surface and colloid science science

7–12 July. 7th International Conference on Surface and Colloid Science. Compiègne, France.

(Secretariat of the 7th ICSCS, c/o Wagons-Lits Tourisme, BP 244, F-92307 Levallois-Perret Cédex, France.)

Computers in chemical research and education

14–19 July. 10th International Conference on Computers in Chemical Research and Education. Jerusalem, Israel.

(Prof. Y. Wolman, Department of Organic Chemistry, The Hebrew University, Jerusalem 91904, Israel.)

Solution chemistry

14–19 July. 22nd International Conference on Solution Chemistry. Linz, Austria.

(XXII ICSC, Institut für Chemische Technologie, Anorganischer Stoffe, Johannes Kepler Universität, A-4040 Linz, Austria.)

Rheology of polymer melts

15–18 July. 14th Discussion Conference on Macromolecules Rheology of Polymer Melts. Prague, Czechoslovakia.

(14th Discussion Conference, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia. Tel. +42 (2) 360341. Fax. +42 (2) 367981. Telex 122019 IMCP C.)

Plasma chemistry

4–9 August. 10th International Symposium on Plasma Chemistry. Bochum, FRG.

(Prof. R. Avni, Conseiller Scientifique, Ambassade d'Israel, 3 rue Rabelais, F-75008 Paris, France.)

IUPAC General Assembly

7–15 August. 36th IUPAC General Assembly. Hamburg, FRG.

(The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

IUPAC Congress

17–22 August. 33rd IUPAC Congress. Budapest, Hungary.

(33rd IUPAC Congress, Prof. E. Pungor, c/o Hungarian Academy of Sciences, H-1111 Budapest, Gellért tér 4, Hungary. Tel. +36 (1) 664 705. Fax. +36 (1) 851 4771. Telex 225931 MUEGY H.)

Organometallic chemistry

25–29 August. 6th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS). Utrecht, The Netherlands.

(Symposium Secretariat OMCOS 6, Congress Bureau, Royal Netherlands Industries Fair, po Box 8500, 3503 RM UTRECHT, The Netherlands.)

Chemical education

25–30 August. 11th International Conference on Chemical Education. York, UK.

(Prof. D. J. Waddington, Department of Chemistry, University of York, Heslington, York YO1 5DD, UK. Tel. +44 (0904) 59861 Telex 57933 YORKUL G.)

Analytical sciences

25–31 August. International Congress on Analytical Sciences. Chiba, Japan.

(ICAS '91 Secretariat, The Japan Society for Analytical

Chemistry, 1–26–2, Nishigotanda, Shinagawa, Tokyo 141, Japan. Tel. +81 (3) 34903351. Fax. +81 (3) 34903572.)

Cationic polymerization

26–29 August. 10th International Symposium on Cationic Polymerization and Related Ionic Processes. Balatonfüred, Hungary.

(Prof. T. Kelen, Institute of Applied Chemistry, Kossuth Lajos University, H-4010 Debrecen, Hungary.)

Spectroscopy of biological molecules

1–6 September. 4th European Conference on the Spectroscopy of Biological Molecules. York, UK.

(Prof. R. E. Hester, Department of Chemistry, University of York, Heslington, York YO1 5DD, UK. Tel. +44 (0904) 59861. Telex 57933 YORKUL G.)

Macrocyclic chemistry

1–6 September. 16th International Symposium on Macrocyclic Chemistry. Sheffield, UK.

(Dr D. E. Fenton, Department of Chemistry, The University, Sheffield, S3 7HF, UK. Tel. +44 (0742) 76855. Fax. +44 (0742) 739826. Telex 547216 UG SHEF G.)

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably **2 YEARS** and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *CI*, Vol. 11, No. 1, pp. 4–5, 1989.

Mössbauer effect

16–20 September. International Conference on the Applications of the Mössbauer Effect. Nanjing, China.

(Prof. Y. F. Hsia, Chairman, ICAME '91, Department of Physics, Nanjing University, Nanjing 210008, China. Tel. +86 (025) 647361. Fax. +86 (025) 403 435. Telex 34151 PRCNU CN.)

Recycling of polymers

18–20 September. International Symposium on Recycling of Polymers: Science & Technology.

(Prof. W. Heitz, Fachbereich Physikalische Chemie der Philipps-Universität, Institut für Polymere, Hans-Meerwein-Strasse, D(W)-3550 Marburg, FRG. Tel. +49 (6421) 285776. Fax. +49 (6421) 285785. Telex 482372 UMR D.)

Self-propagating high-temperature synthesis (SHS)

23–28 September. 1st International Symposium on Self-Propagating High-Temperature Synthesis (SHS). Alma-Ata, USSR.

(Dr O. E. Kashireninov, Institute of Structural Macrokinetics, 142432 Chernogolovka, Moscow Region, USSR.)

Electron spin echo spectroscopy

25–28 September. International Workshop on Electron Echo Spectroscopy. Novosibirsk, USSR.

(Prof. Yu. D. Tsvetkov, Institute of Chemical Kinetics & Combustion, Novosibirsk 630090, USSR.)

Macromolecule–metal complexes

30 September–5 October. 4th International Symposium on Macromolecule–Metal Complexes. Siena, Italy.

(Prof. R. Barbucci, Dipartimento di Chimica, Università di Siena, Piano dei Mantellini 44, 53100 Siena, Italy.)

New polymers

30 November–1 December. International Symposium on New Polymers. Kyoto, Japan.

(Prof. Toshinobu Higashiura, Department of Polymer Chemistry, Kyoto University, Yoshida, Sakyo-ku Kyoto 606, Japan.)

CHEMRAWN VII

2–6 December. World Conference on Chemistry of the Atmosphere: Its Impact on Global Change. Baltimore, Maryland, USA.

(CHEMRAWN VII Secretariat, c/o American Chemical Society, Room 205, 1155-16th Street, NW, Washington, D.C. 20036-4899 USA.)

1992

Enzymes in organic synthesis

6–9 January. International Symposium on Enzymes in Organic Synthesis. New Delhi, India.

(Dr V. S. Parmar, Department of Chemistry, University of Delhi, Delhi-110007, India.)

Organic synthesis

5–9 July. 9th International Conference on Organic Synthesis. Montréal, Québec, Canada.

(Prof. Jean-Claude Richer, Département de Chimie, Université de Montréal, CP 6128 succursale A, Montréal, Québec H3C 3J7, Canada.)

Ring opening polymerization

7–12 July. International Symposium on Ring Opening Polymerization. Warsaw, Poland.

(Prof. Zbigniew J. Jedlinski, Institute of Polymer Chemistry, Polish Academy of Sciences, 34 M. Curie-Sklodowska St., 41–300 Zabrze, Poland.)

Risk management of chemicals

13–16 July. International Symposium on Risk Management of

Chemicals: Can Chemicals be Used Safely? Guildford, UK.

(Dr J. F. Gibson, Secretary (Scientific), The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

Macromolecules

13–18 July. 34th International Symposium on Macromolecules. Prague, Czechoslovakia.

(IUPAC Macro 92 Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského nám. 18882/2, 16206 Prague 6, Czechoslovakia. Tel. +42 (2) 360317. Telex 122019 IMCP C.)

Coordination chemistry

19–24 July. 29th International Conference on Coordination Chemistry. Lausanne, Switzerland.

(Prof. A. E. Merbach, Institut de Chimie Minérale et Analytique, Université de Lausanne, Place du Château 3, CH-1005 Lausanne, Switzerland.)

Exploration, mining and processing of materials

3–7 August. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Randburg, Transvaal, Republic of South Africa.

(Dr V. C. O. Schuler, PO Box 35307, Northcliffe, 2115, Republic of South Africa.)

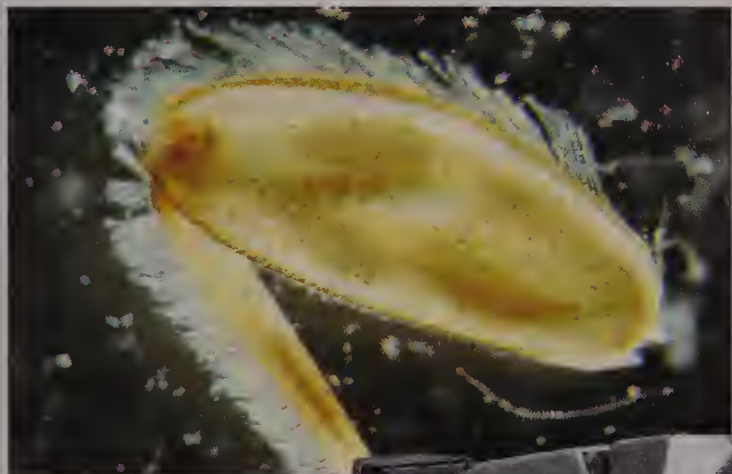
1993

Bioorganic chemistry

7–10 June. 2nd International Symposium on Bioorganic Chemistry. Fukuoka, Japan.

(Prof. Yukito Murakami, Department of Organic Synthesis, Faculty of Engineering, Kyushu University, Hakozaki, Higashi-ku, Fukuoka 812, Japan.)

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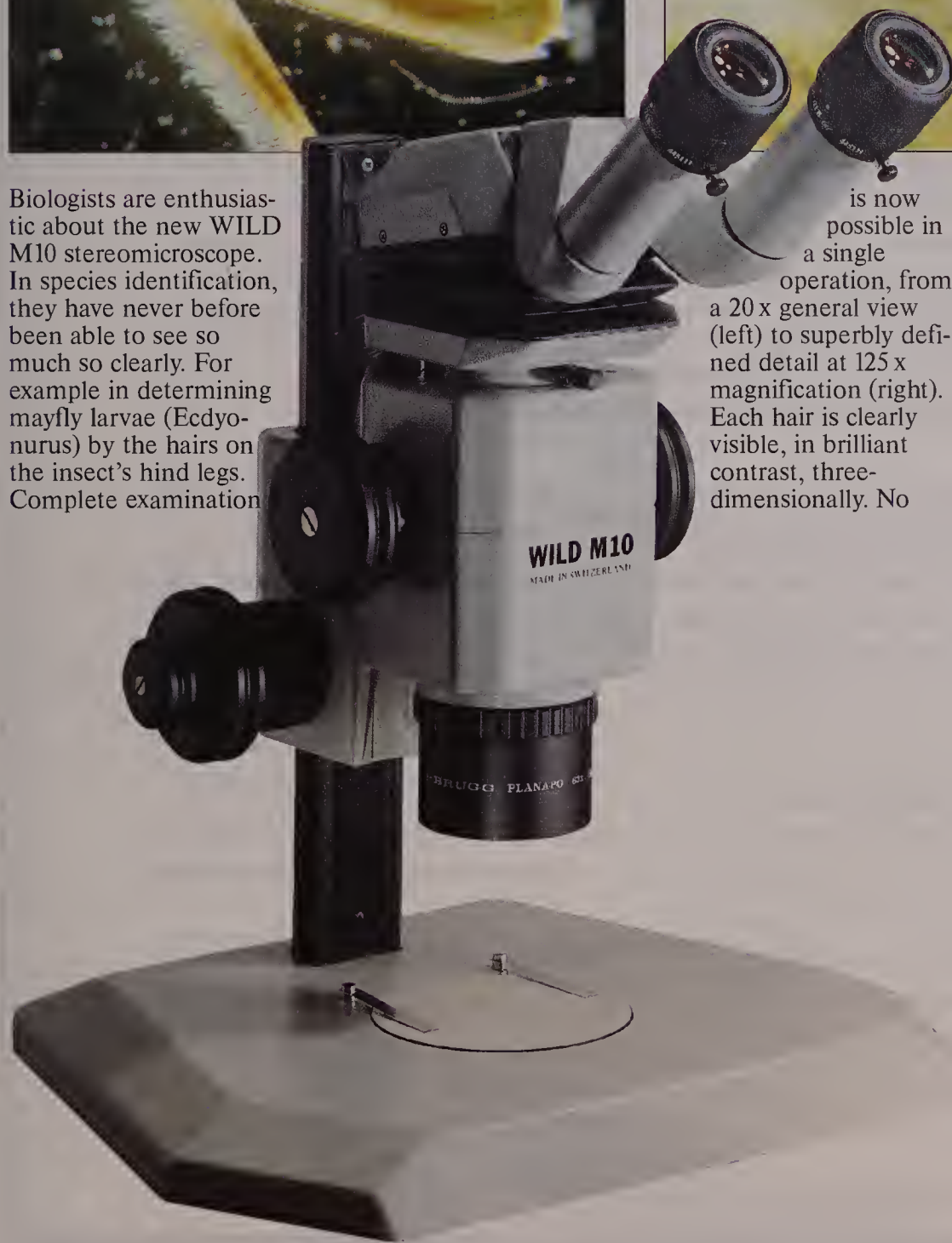


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Official Journal of the International Union of Pure and Applied Chemistry

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- to publish the recommendations of the Union's commissions on nomenclature, symbols and units;
- to publish technical reports on standardization, recommended procedures, collaborative studies, data compilations, etc.;
- to publish critically evaluated state-of-the-art commissioned review articles on important topics.

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EDITOR

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1989. 778 pages, 403 illustrations.

Cloth £29.95. ISBN 0 632 02016 4.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 43 countries, each represented by a national organization, such as an academy of science or research council.

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Chemistry International



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Chemistry International

The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



1991, Vol. 13. No. 3 (May)

Blackwell Scientific Publications

Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Six issues of *Chemistry International* will be published in 1991. The 1991 subscription rate including postage is GBP 37.50 (UK), GBP 37.50 (overseas except North America) USD 58.00 (US and Canada). The individual subscription rate is USD 33.00. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Blackwell Scientific Publications Ltd, PO Box 88, Oxford, UK.

Advertising. Enquiries should be sent to The Editor, *Chemistry International*, at the above address, or the Advertising Manager, Blackwell Scientific Publications Ltd, Osney Mead, Oxford OX2 0EL, UK (telephone no. +44 (865) 240201, telex 83355 Medbok G, fax +44 (865) 721205).

Despatch. The news magazine is despatched within Europe by surface mail, to other continents by various forms of air speeded delivery: to the US* by air freight for forwarding by second class post, to India by air freight for guaranteed local delivery, and to all other countries by Accelerated Surface Post.

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Front cover: Conference registration at the International Congress Center, Stockholm (*Photo courtesy K. E. Sundqvist*).

Information for affiliates

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available free of charge to affiliates and members of IUPAC's commissions and committees. The poster is printed in blue and black on a white background and is approximately 42 x 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International (CI)*, please indicate that the letter is 'Submitted for publication in *CI*'.

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Free copies of booklet available to affiliates

Copies of an attractive 64-page illustrated booklet on *The IUPAC programme on chemistry and the environment* have been distributed to members of IUPAC commissions and committees, national adhering organizations and other bodies associated with IUPAC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Affairs Secretary.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon *or* navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 88 of the July 1990 issue of *CI*. Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually — but not always — announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal.

Glossary of atmospheric chemistry terms

A limited number of copies of a 62-page *Glossary of atmospheric chemistry terms* is available to affiliates on application to the IUPAC Secretariat. The glossary was prepared for publication by Prof. Jack G. Calvert, Chairman of the Commission on Atmospheric Chemistry (VI.4), and published in *Pure and Applied Chemistry* (Vol. 62, No. 11, pp. 2167-219).

The glossary defines over 620 atmospheric chemistry terms which are in common use by the international research community in atmospheric sciences. Recommendations of Commission VI.4 are given where alternative terms are in common use to describe a given process, piece of equipment, feature, or quantity used in atmospheric chemistry.

The range of terms include composition of the atmosphere, clouds, solar radiation, chemical and physical changes in atmospheric components, instrumentation employed in analysis of the atmospheric components and in air-quality control, and in effects of certain trace gases on materials, plants and animals.

To obtain a copy, free of charge, please apply to the Affiliate Affairs Secretary at the IUPAC Secretariat.

New Zealand: 60th Anniversary Conference

The 60th Anniversary Conference of the New Zealand Institute of Chemistry (NZIC) and the New Zealand Biochemical Society will be held at the University of Canterbury from Monday 26th August to Wednesday 28th August 1991.

The conference will follow a format of symposia to focus attention on various aspects of chemistry and biochemistry. Symposia themes will include the 'History of the NZIC' chaired by IUPAC affiliate Denis Hogan who was responsible for initiating operation of the IUPAC Affiliate Membership Programme in New Zealand.

Further information is available from the conference secretary: Dr R. G. A. R. MacLagan, Department of Chemistry, University of Canterbury, Christchurch. Tel: +64 (3) 667 001. Fax: +64 (3) 483 308. e-mail: CHEM171@CANTERBURY.AC.NZ.

Committee on Affiliate Membership

The next meeting of the IUPAC Committee on Affiliate Membership (CAM) will be held on Sunday 11th August 1991 during the 36th IUPAC General Assembly in Hamburg, Germany. The following are the members of the committee, together with their addresses for correspondence concerning affiliate affairs and the next meeting of CAM.

Prof. T. S. West (Chairman), c/o Affiliate Affairs Secretary, IUPAC Secretariat.

Prof. M. T. Beck, Fizikai Kémiai Tanszék, Kossuth Lajos Tudományegyetem, Egyetem tér 1, H-4010 Debrecen, Hungary. Tel: +36 (52) 16 666. Telex: 72200 UNIVK H.

Prof. E. Fluck, Gmelin-Institut für Anorganische Chemie und Grenzgebiete der Max-Planck-Gesellschaft, Carl Bosch Haus, Postfach 900467, Varrentrappstrasse 40-42, D(W)-6000 Frankfurt/Main 90, FRG. Tel: +49 (69) 791 7210. Telex: 412526 GMELI D. Fax: +49 (69) 791 7338.

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Tel: +1 (201) 455 4729. Telex: 1-36410. Fax: +1 (201) 455 6840.

Prof. S. Itô, Faculty of Pharmaceutical Sciences, Tokushima Bunri University, Yamashiro-cho, Tokushima, 770 Japan. Tel: 81 (886) 22 9611, ext. 5531. Fax: +81 (886) 55 8774.

Prof. H. A. Staab, Max-Planck-Institut für Medizinische Forschung, Jahnstrasse 29, D(W)-6900 Heidelberg, Germany. Tel: +49 (6221) 486421. Telex: 461 505 MPIMF D. Fax: +49 (6221) 486351.

Prof. K. I. Zamaraev, Institute of Catalysis, 5 Prospekt Akademica Lavryentyeva, SU-630090 Novosibirsk 90, USSR. Tel: +7 (3832) 355 750. Telex: 133122 SOVET SU. Fax: +7 (3832) 35 57 56.

Dr. M. H. Freemantle (Secretary), IUPAC Secretariat.

CAM Chairman Tom West, in his Secretary General's Column in this issue (see p. 92), invites affiliates to write to him with submissions for the CAM meeting in Hamburg. He asks: "How can we help your interests in IUPAC? What would you like IUPAC to do for you as an affiliate member? What would you like to do for IUPAC?"

Have you received your affiliate documents?

Every affiliate receiving a copy of this issue of *CI* will find, inserted in the magazine, a white envelope addressed to affiliates. The envelope contains the following documents:

- a letter from the IUPAC Affiliate Affairs Secretary explaining the benefits of affiliate membership;
- a green laminated card containing an abbreviated list of *Quantities, Units and Symbols in Physical Chemistry*;
- an IUPAC affiliate membership card; and
- an IUPAC affiliate membership certificate.

If your copy of the magazine does not contain this package of documents *and* you are a registered affiliate for 1991, then please inform the Affiliate Affairs Secretary at the IUPAC Secretariat. He will be pleased to send you replacement documentation.

The Affiliate Affairs Secretary would appreciate any feedback on this new initiative aimed at improving the benefits IUPAC provides for affiliates. If successful, affiliates will be sent this type of documentation in the May issue of *CI* each year.

The system works



'The system works!' – on the right, Mrs Erica Sheppard (IUPAC Secretariat) finally sees on the screen that the computerized accounting system installed at the IUPAC Secretariat in Oxford during the past year really does generate the 1990 IUPAC accounts. These accounts were previously drawn up by the IUPAC banker, Schweizerische Bankgesellschaft, in Zürich. On the left, Mrs Lynn Brett (ex-UK Royal Society of Chemistry) who supervised the installation looks on (see also *CI*, Vol. 11, No. 6, p. 243, 1989 and Vol. 12, No. 6, p. 237, 1990).

Gems in the history of chemistry – Part I

According to a medical book published in the 1920s, radioactivity is an outstanding feature of certain spa waters in Britain.

Stanley Brown, who is Past-President of the Clinical Chemistry Division, found some enlightening examples of chemical history when he was glancing through medical and chemistry books in his personal library last year. He suggested we publish them in *CI* and even start a regular column to which readers might submit contributions.

The first concerned radioactivity and was published about 1924 in *The Spas of Great Britain: The Official Handbook of the British Spas Federation* compiled from the reports of the local medical committees for the use of the medical profession at that time. A spa, incidentally, is defined as a 'mineral spring: a mineral water resort'.

Two such resorts in Britain referred to in the handbook are Bath and Droitwich.

The following excerpts are taken from pages 22–24 and 106 of the book:

Pharmacology. The chief physical and chemical properties of the Bath waters may be summarized as follows:

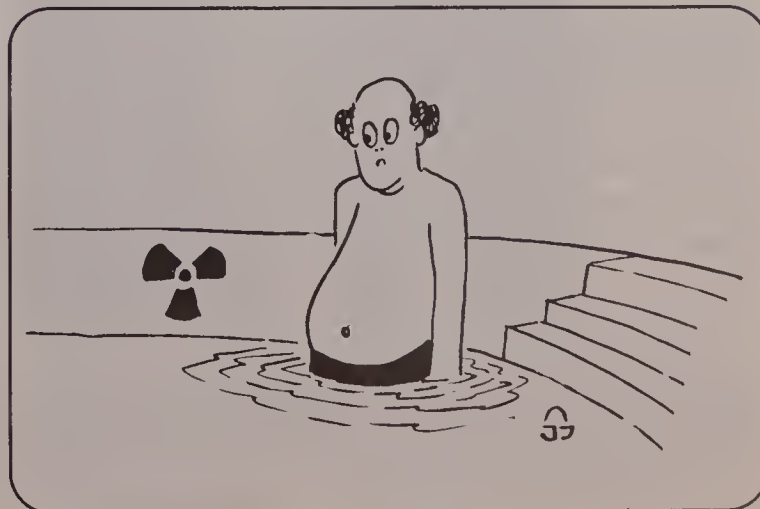
1. Absence of unpleasant taste or smell.
2. High natural temperature (120°F).

3. Relatively high percentage of calcium salts.
4. Extremely small amount of sodium salts.
5. Pressure of minute quantities of iron salts.
6. High degree of radioactivity.

Radioactivity. The outstanding feature in the Bath waters is their high degree of radioactivity, and there is strong reason for thinking that this factor is largely responsible for their physiological properties. It has long been recognized that the effects of the so-called 'indifferent' thermal waters of low mineralization on such diseases as gout and other conditions of deficient excretion cannot be fully explained in virtue of the small amount of mineral salts they contain. On the other hand, numerous experiments with artificially prepared radioactive solutions have shown that these produce a definite increase in digestive and metabolic activity.

Laboratory experiments prove that, under the influence of radium emanations, monurate of sodium can be changed from an insoluble to a soluble form, which subsequently decomposes into ammonia and carbon dioxide. Dr His and others state that in cases of gout treated by radium emanations, the uric acid content in the blood was noticeably diminished in a large proportion of cases.

While it is impossible to state how far radioactivity, apart from other factors, is responsible for the physiological effects of a natural thermal water such as that of Bath, the close similarity between the results obtained by radium emanations alone and those obtained by a course of natural waters affords strong presumptive evidence that radioactivity constitutes an important factor in the effects of the latter.



The nearest approach to the Droitwich brine is found at Bex, Rheinfelden, Biarritz-Briscous, Salies-de-Béarn, and Salzungen, though the Droitwich waters by comparison are of much greater potency than those at any of the above-mentioned foreign spas.

The natural temperature of the brine is about 45°F i.e. 7.2°C. It is practically sterile and seems to be almost antiseptic, whilst experiments made by the late Sir James Dewar, Professor Horatio Ballantyne, F.I.C., F.C.S., and other scientists show it to be radioactive and radioemanative to an important degree, the air of the bathrooms being particularly impregnated with radioemanations after the steam heating has been applied to bring the brine to the required temperature.

Another of Stanley Brown's gems in the history of chemistry will appear in a future issue of the magazine. The editor invites readers to submit other gems lifted from antique medical and scientific books.

Errors in published accounts for 1989

The following errors appeared in the 1989 accounts published in the November 1990 issue of *CI*:

- In the left-hand (Assets) column of the Balance Sheet on page 238, the figure for *Sterling Cash in Banks* should read (USD) 30 919 and not (USD) 39 919.
- On page 239, which shows Notes for 1989 Balance Sheet, the total for (a) *Cash in East European Banks* should be (USD) 9 888.50 and not (USD) 9 936.00.
- On page 240 under Income the words 'and Capital Gain Realized' should be deleted. The figure of (USD) 195 690.72 refers only to *Interest and Dividends Earned*.
- On page 240, in note (c) at the foot of the right-hand column, the first sentence "The words 'Capital Gain Realized' have, by error, not been included in the text previously." should be deleted.

Officers of the Commission on Atmospheric Chemistry

On page 10 of the January 1991 issue of *CI* we mistakenly referred to Dr Sjaak Slanina as Chairman of the Commission on Atmospheric Chemistry. Dr Slanina is, in fact, Secretary of the Commission. The Chairman is Prof. Jack Calvert (see page 78 of the

We regret to record the death of Prof. C. N. Flerov (19 November 1990). Commission on Atomic Weights and Isotopic Abundances (1967–1975).

March 1991 issue). Apologies to Dr Slanina and Prof. Calvert for this error.

If it moves

At the Bureau of Indian Standards (BIS) International Conference held in New Delhi, July 1990, Dr Lawrence D. Eicher, Secretary-General of the International Standardization Organisation (ISO) presented a paper on 'Standardization and quality systems for the '90s.' The following quote is from the published version of Eicher's paper:

'Recently, I read a set of lecture notes that were being used by a private consultant who was making good business by telling others how to use the ISO 9000 standards. On the last page was his "short and sweet" summary message relating to quality systems management as he saw it. The message said:

If it moves, train it.

If it doesn't move, calibrate it.

And, if it isn't written down, it didn't happen.

I think those who have worked with implementing total quality management systems will agree that this "short and sweet" summary says quite a lot.'

Names and addresses

Full details (names, addresses, telephone/telex/fax numbers) of all commission and committee chairpersons and secretaries and IUPAC officers were published in the November 1989 issue of *CI* (Vol. 11, No. 6, pp. 225–35). The IUPAC Secretariat has been notified recently of the following appointments, and changes:

Prof. Irina P. Beletskaya (President, Organic Chemistry Division). Tel: +7 (095) 939 3618.

Prof. J. Calvert (Chairman, Commission on Atmospheric Chemistry). Fax: +1 (303) 497 1400.

Dr L. E. Coles (President, Applied Chemistry Division). Tel: 0222 492233.

Prof. J. Corish (Secretary, Commission on High Temperature and Solid State Chemistry). Fax: +353 (1) 712826.

Prof. J. R. De Laeter (Chairman, Commission on Atomic Weights and Isotopic Abundances. Tel: +61 (9) 351 3045. Fax: +61 (9) 351 3048.

Prof. M. P. Doyle (Secretary, Commission on Physical Organic Chemistry). Fax: +1 (512) 736 7229.

Dr R. A. Durst (Chairman, Commission on Electroanalytical Chemistry). Tel: +1 (315) 787 2297.

Dr D. F. Eaton (Secretary, Commission on Photochemistry). Telex: 6504311780.

Prof. Ph. Grandjean (Chairman, Commission on Toxicology. Department of Environmental Medi-

cine, Institute of Community Health, Odense Universitet, J. B. Winsløws Vej 17, DK-5000 Odense C, Denmark. Tel: +45 66 15 86 96, ext. 4768. Fax: +45 65 91 82 96.

Prof. H. Heikkinen (Secretary, Committee on Teaching of Chemistry). Department of Chemistry and Biochemistry, College of Arts and Sciences, University of Northern Colorado, Greeley, Colorado 80639. USA. Tel: +1 (303) 351 1289. Fax: +1 (303) 351 1269.

Dr T. Kiss (Secretary, Commission on Equilibrium Data). Fax: +36 (52) 10936.

Dr N. Koga (Secretary, Section on Medicinal Chemistry). Tel: +81 (3) 3272 0611/3273 7162. Fax: +81 (3) 3272 6898.

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Prof. M. Ringpfeil (Chairman, Commission on Biotechnology). Tel: +37 (2) 349 7003. Fax: +37 (2) 349 4168.

Prof. K. V. Sané (Chairman, Committee on Teaching of Chemistry). Telex: 3178099 DU IN. Fax: +91 (11) 615176 (c/o Director, UNESCO, New Delhi).

Prof. N. Sheppard (Chairman, Interdivisional Committee on Nomenclature and Symbols). Fax: +44 (603) 259396.

Prof. K. S. W. Sing (Chairman, Commission on Colloid and Surface Chemistry including Catalysis). Fax: +44 (895) 56844.

Dr Joann F. Sullivan (Secretary, Commission on Molecular Structure and Spectroscopy). Tel: +1 (803) 777 2505. Fax: +1 (803) 777 2451.

Prof. D. G. Tuck (Chairman, Commission on Equilibrium Data). Fax: +1 (519) 973 7050.

Dr H. P. Van Leeuwen (Secretary, Limited Life Time Commission on Environment Analytical Chemistry). Fax: +31 (8370) 84141.

Prof. G. S. Wilson (Secretary, Commission on Electrochemistry). Tel: +1 (913) 748 0968.

Dr W. J. Work (Secretary, Commission on Macromolecular Nomenclature). Telex: 650 419 0136.

The German Chemical Society

Wolfgang Fritsche

The German Chemical Society (GDCh) is the host and organizer of the 36th IUPAC General Assembly which takes place in Hamburg in August. In this article, Dr Wolfgang Fritsche, Secretary General of GDCh, outlines the structure, activities and output of GDCh — past, present and future.

Introduction

Gesellschaft Deutscher Chemiker (GDCh) — the German Chemical Society — will be the host and organizer of the 36th IUPAC General Assembly to be held in Hamburg from the 7th to the 15th August 1991. It is acting on behalf of 'Deutscher Zentralausschuss für Chemie', the umbrella organization which is the IUPAC National Adhering Organization of the Federal Republic of Germany (FRG). The society, which also hosted the 27th IUPAC General Assembly in Munich in 1973, has a long and successful tradition reaching back to the last century.

The nineteenth century saw great advances in sciences in Europe. Rapid and fruitful development of chemical research and teaching at universities during the middle of the century was paralleled by the foundation of successful chemical industries whose processes were based on the scientific achievements of learned chemists. Names like A. W. von Hofmann and Justus von Liebig were as intimately linked to the foundation of centres for research and teaching of chemistry at universities as with fundamental research on chemical com-



Dr Wolfgang Fritsche is Secretary General of GDCh, Secretary of Deutscher Zentralausschuss für Chemie (the IUPAC National Adhering Organization in Germany) and Chairman of the Council of the Federation of European Chemical Societies.

pounds which were industrially exploited with unparalleled success and formed the basis for German chemical industry.

These developments resulted in an increase in the number of scientists, and naturally also in a decrease in their exclusivity. A consequence of this was the desire to create scientific societies open to all interested scientists. Former scientific associations, like the academies, had very few members.

It was only logical that during the nineteenth century chemical societies were created in all major European countries. The German Chemical Society was founded in 1867. A second society was founded in 1887, namely the Association of German Chemists. This association was different in character, because it had a stronger professional component. Nevertheless, both societies were scientific societies and they existed in parallel and cooperated well until the end of World War II when both societies were dissolved by order of the allied authorities.

Re-birth and eventual re-unification

The German chemical community was able to renew the structure of the society on its re-birth after the war. A new society, namely 'Gesellschaft Deutscher Chemiker' was inaugurated in 1947. It carried forth the good traditions and heritage of both former societies for the benefit of chemistry and chemists in Germany and the international chemistry community.

A similar society was created in 1953 in the former German Democratic Republic (GDR). The political changes in Europe and particularly in Germany which started in autumn 1989 led to the establishment of closer contacts between the two societies early in 1990, with the final goal of re-unification a consequence of the re-unification of the two German states which took place on 3 October 1990. The Chemical Society of the GDR was wound up on 31 December 1990 following a vote by its members.

Their members have become members of GDCh — a process which is still going on.

GDCh today

Today, GDCh has about 26 000 members including about 5000 university chemistry students, nearly 200 chemical companies and about 1500 members who live in other countries. The total number of members has been growing for many years, and still shows a positive tendency. With very few exceptions, all regular members must have had a university education and have appropriate qualifications.

The 19 divisions operating within the society are independent in their scientific activities although they do not have independent legal status. They therefore operate within the framework of the

statutes of GDCh. Their administration is taken care of by society staff at the headquarters in Frankfurt. Divisions focus their activities on special fields of chemistry such as:

- Analytical Chemistry;
- Applied Electrochemistry;
- Pigments and Dyes;
- Solid-State Chemistry;
- Photochemistry;
- Macromolecular Chemistry;
- Environmental Chemistry and Ecotoxicology;
- Nuclear Chemistry;
- Biochemistry;
- Medicinal Chemistry;
- Food and Forensic Chemistry;
- Water Chemistry;
- Chemistry of Detergents;
- Chemistry – Information – Computers;
- Chemical Education;
- Others, e.g. History of Chemistry.

Gesellschaft Deutscher Chemiker



Carl-Bosch-Haus in Frankfurt am Main is the headquarters of GDCh.

If you require further information about GDCh please contact:

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Carl-Bosch-Haus
Varrentrappstrasse 40-42
D-6000 Frankfurt/Main 90
Germany

Tel: +49 (69) 79171
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All divisions contribute considerably to the overall activities of GDCh. Some of them have gained importance over recent years because of their relevance to environmental problems. This has particularly been the case with our divisions on Food Chemistry, Analytical Chemistry, Environmental Chemistry and Ecotoxicology, and Water Chemistry (this division has been in existence for 65 years).

Local sections

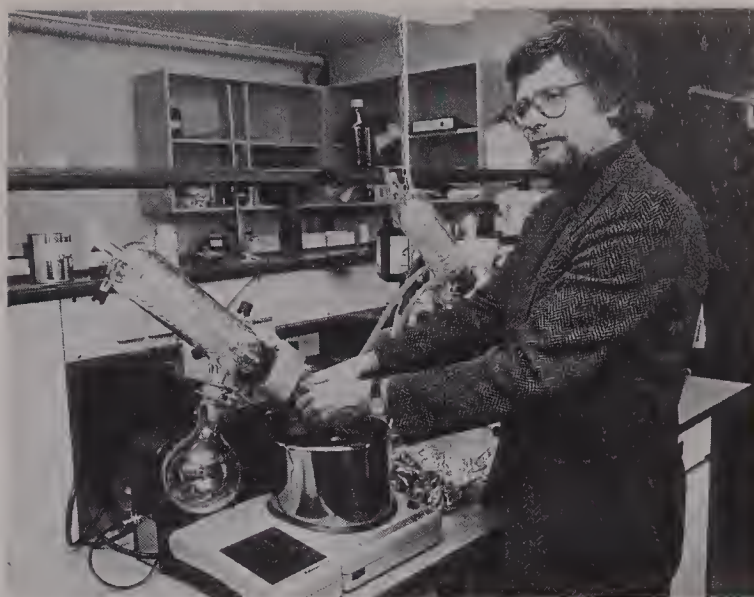
GDCh has 60 local sections. These range from larger ones like the one in Frankfurt with about 1800 members to others in smaller cities with only around 100 members.

The local sections fulfil an important task within GDCh, because they provide a geographical infrastructure of society activities in FRG. This is an efficient tool for reaching every individual member of the society. A typical local programme includes a lecture every two weeks or so. Such activities facilitate contacts between individuals and GDCh.

The local sections are chaired by elected honorary chairmen who, together with the chairmen of the divisions and the 15 members of the Board of GDCh, constitute the Council which meets once every year and which has certain statutory tasks including the approval of the annual budget of the society. It is evident that the local sections in university cities are more or less part of the chemical faculty of the local university, whereas local sections in industrial areas have a more applied character.



GDCh has close ties with the chemical industry. In particular, local sections in industrial areas tend to focus their activities on applied subjects.



GDCh working groups are concerned with a range of topics including analytical methods and environmental problems.

Working groups

In addition to the divisions and local sections which are laid down in the statutes, there are working groups or committees — some of them *ad hoc*, some of them permanent. Nowadays their task is to elaborate directives and recommendations for analytical methods and so on, particularly in connection with environmental problems and associated legislation.

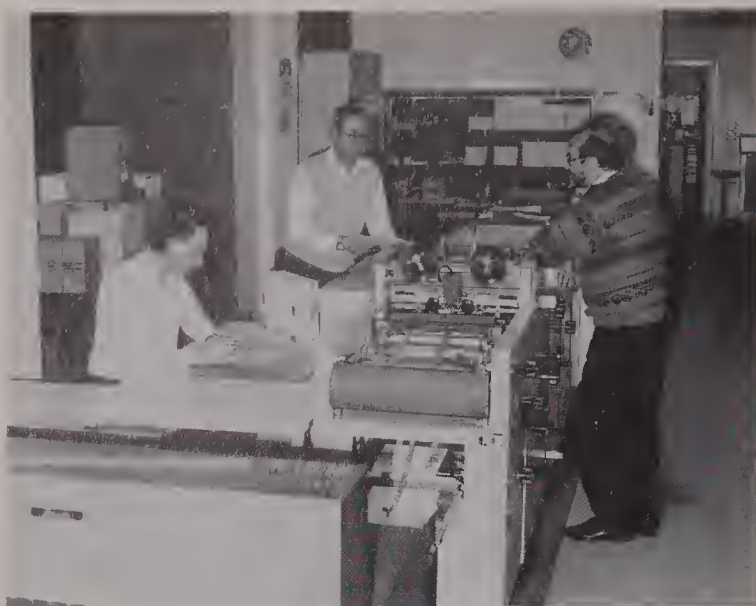
GDCh has become considerably more active in this field over recent years and has established close contacts with relevant ministries and government authorities in order to influence them to consider the advice offered by the society. We are pleased to say that GDCh is becoming increasingly accepted as an expert body in this sense.

About eight years ago, the Federal Ministry of the Interior and the Federal Ministry for Youth, Family and Health asked GDCh to establish a committee for the examination and classification of existing substances in regard to their potential hazardous effects. The ministries needed this information for legislation on the use of chemicals. The results of the work of this committee have been incorporated into relevant regulations.

The acceptability of these results by the German government and also the general public largely depends on the ability of the society to maintain a neutral position in the triangle of tension between pure science, industry and government.

These and similar activities mentioned below can only be handled by a permanent staff. There are 35 employees at the headquarters in Frankfurt. These include five doctors of chemistry, one financial manager and about 15 external employees working on specific projects. Additional staff are responsible for the society's publications and journals.

About 50% of the budget is financed by membership fees including the contributions of



The automated mailing department at GDCh in Frankfurt.

chemical industry; the rest comes from income from property of the society and from income generated by its publishing house VCH Verlagsgesellschaft mbH, 90% of which is owned by GDCh.

Communication platform

GDCh provides a forum and a communication platform for the dissemination of information about various topics of interest to members and about recent research results. Chemists from universities, from industry, from government laboratories meet on this platform as do school teachers and chemistry students.

There is hardly any other discipline in science or technology in which this benefit of learned societies is so evident as it is in chemistry. The present high level of chemical knowledge and the status of the chemical industry in human society and its place in world economics provide the proof of this statement.

There are a variety of ways in which GDCh plays its role in the communication of chemistry. Some of them are traditional and stem from the primary



Administration of GDCh membership is computerized.

activities of the older societies immediately after their foundation in the last century. These still constitute a valuable portion of present activities although their importance may have changed due to the special needs of the times and sociological, scientific and environmental requirements. Additional activities have developed in recent decades and some of these are particularly important nowadays.

We should never forget that the main objectives of a chemical society is to promote chemistry as a pure and applied science. Therefore, the improvement of the knowledge and proficiency of individual chemists will automatically benefit research and the industrial applications required to meet the needs of mankind. The intellectual gain on the other hand will improve the professional status of a chemist within his company, in his university or school, and in society in general.

Thus, the activities of GDCh also contain a professional component, which has gained in importance over recent years owing to unfavourable developments in the image of chemistry. The professional aspect, however, should not be over-emphasized in comparison with the other activities, since otherwise GDCh would, at least in part, lose its character as a learned society. The activities of a professional character should consequently always and only be based on the scientific background represented by the society.

Scientific literature

What are the tools GDCh employs for promoting the transfer of knowledge? First of all, scientific literature — publication of which was one of the first activities of the society following its creation.

All chemists will certainly know and have used journals of the society such as *Chemische Berichte*, *Liebigs Annalen der Chemie*, *Angewandte Chemie* and others. These are some of the leading journals in the world and are part of the so called 'primary literature'.

Abstract journals also play a very important role in the activities of the large chemical societies and serve the rapid transfer of new knowledge in chemistry on a world-wide scale. GDCh, immediately after its foundation in 1867, took over publication of *Chemisches Zentralblatt*. It was the first abstract journal of its type, and it set an example not only for similar abstract journals created later by other chemical societies such as *Chemical Abstracts*, but also for similar journals in other disciplines of science and technology.

The plethora of entries in the abstract journals which belong to the 'secondary literature' increased in parallel to the development of the primary literature. In 1970, however, publication of this, the first abstract journal in chemistry, ceased after a successful reign of more than 100 years. It soon became evident that it was not possible to make up

for the aftermath of World War II in Germany. The journal *Chemical Abstracts* published by the American Chemical Society did not suffer this handicap, and gained more and more prominence. It also had the advantage of the English language which rapidly became the *lingua franca* of scientists throughout the world.

Finally, for most of the chemical societies involved in secondary literature, it seemed justified to concentrate all efforts in an international scheme for the future in this sector on the basis of the Chemical Abstracts Service.

Nowadays, secondary literature is available not only on printed paper, it is also stored in computers. In this sector, GDCh closely cooperates with the Federal Ministry Centre on Chemistry on 1st January 1982. From our society, about 100 employees in the documentation and information department in Berlin, which in former years was responsible for *Chemisches Zentralblatt*, were taken over by the information centre, and GDCh is represented on the supervisory board.

There are other ways in which GDCh takes responsibility for the promotion of chemistry — for example, by the transfer of information at conferences, symposia and congresses. These meetings may be devoted to a narrow field of chemistry for specialists, but they can also cover the whole spectrum of chemistry. Large meetings, where various sections participate, give the chemist working in a specialized field of research or application the possibility of brushing up his overall knowledge and widening his intellectual horizons on broader frontiers of science.



A conference room at Carl-Bosch-Haus.

In-service training and chemical education

In-service training as a continuous process of learning during one's professional life is of utmost importance to anybody active in the natural

sciences and technical disciplines. This is inevitable if we reflect on the rapid rate of development we have witnessed during the last few decades. So it was imperative that GDCh added programmes of in-service training to its traditional activities. GDCh carried out some pioneering work in this area which is internationally acknowledged as setting a good example.

For more than 20 years we have been offering about 85 in-service training courses and 40 information days per year covering almost all fields of chemistry and chemical technology. The courses generally last five days and are offered at university institutes particularly suited to the specific theme in question.

Such contributions to continued communication in chemistry are more or less restricted to the activities of each national chemical society because of the special needs of each particular country and last but not least because of the language barrier. International cooperation in this field was, however, considered to be important. As an experiment, one of the GDCh courses on 'Selected topics of natural product chemistry' was 'exported' to Mahidol University in Bangkok, Thailand, in March 1983 and in 1985 the same course was offered in Guangzhou, Shanghai and Beijing in China.

It is also a task and a challenge for GDCh to take an active part in chemical education, because it is here that the communication of chemistry begins. Chemistry will only flourish if, in generations to come, there are talented, capable and well-educated scientists available in the numbers required by society at large. This gives rise to two important aspects for GDCh.

First of all, it must assist in balancing the supply and demand of chemists by analysing the present situation, extrapolating it into the future and making suitable recommendations.

The other important issue is the influence of GDCh on the curricula in chemistry offered in the secondary schools and universities. The reservoir of a large membership offers the necessary competence required to offer advice to politicians concerned with education. Taking care of the education of future scientists is also a part of professional policy, since a good education ultimately guarantees the professional status of a scientist and his personal professional satisfaction.

The professional chemist of the future will most certainly need a thorough background of scientific knowledge. But to provide scientific capability cannot be the ultimate and only goal of university chemical education. The enormous problems facing mankind, such as overpopulation, depletion of resources, environmental contamination, ecological imbalance and so on, demand an awareness of the potential solutions possible through application of the natural sciences. It is the task of national

chemical societies to take care of this aspect of chemical education in close cooperation with the relevant authorities in their countries.

The communication of science and technology to politicians is another important issue. GDCh has increasingly succeeded in achieving this goal in recent years. GDCh also feels an obligation to inform the general public about the benefits of scientific and technological progress, especially since certain groups are making efforts to denounce such progress — progress which is essential for the survival of the human race.

The chemical community must step out of its ivory tower of exclusivity and transfer its ideas and ways of thinking, as well as its knowledge, in an understandable form to the general public. The public-relations department of GDCh cooperates with the mass media in order to achieve good and effective communication.

International activities

GDCh maintains excellent international relations not only with national chemical societies in neighbouring countries, but also through active participation in the Federation of European Chemical Societies (FECS) which was founded in 1970. The General Secretariat of FECS was held by GDCh for 12 years from 1976 to 1988 and the author of this article was then one of the two Secretaries General. He is now Chairman of the FECS Council.

Relations and cooperation with IUPAC have been very close for many decades. GDCh, through Deutscher Zentrallausschuss für Chemie, provided input to the Union's activities as well as always recommended prominent chemists for IUPAC bodies. The IUPAC congresses of 1959 in Munich, 1973 in Hamburg and 1983 in Cologne were organized and financed by GDCh with support from German chemical industry and government authorities. A number of special IUPAC conferences and symposia organized by GDCh have also taken place in Germany.

Affiliate Membership Programme in Germany

All individual members of GDCh are entitled to affiliate membership of IUPAC. In 1990, just over 50 German chemists registered as IUPAC affiliate members through the society



Mrs Jutta Bröll is responsible for GDCh international activities and the administration of the IUPAC affiliate membership programme in Germany.

Mrs Jutta Bröll is the secretary responsible for all international activities at the GDCh Secretariat in Frankfurt. These include administration of the IUPAC affiliate membership programme in Germany and relations between IUPAC and Deutscher Zentrallausschuss für Chemie — the German National Adhering Organization of IUPAC — as well as the Societies and Dr Fritzsche's personal involvement in the Federation of European Chemical Societies (FECS).

If you are a member of GDCh and wish to become a IUPAC Affiliate Member please apply directly to GDCh using the address given above.

We are now proud to be the host of the 36th General Assembly of IUPAC, and we sincerely hope to be able to live up to the expectations of the Union and its members.

Auf Wiedersehen in Hamburg!

Secretary General's Column

Tom West

The 1990 Bureau meeting in Milan, the new mission orientated programmes and relations with ICSU are amongst the topics discussed by Secretary General Tom West in his column below.

Bureau meetings

The IUPAC Bureau consists of elected members representing the National Adhering Organizations (NAOs) of the Union together with the eight division and section presidents, the four officers and the immediate past-president. Its main function is to

oversee the business of the Union between meetings of the Council and to prepare matters for decision by the latter. The Council consists of the delegates chosen by the NAOs and is appointed and constituted only for two days every two years.



The Villa Sacro Cuore was the venue for the IUPAC Bureau meeting, 23–24 September 1990. The villa is located in Triuggio which is near Monza and Milan. Bureau member Prof. Norberto Montalbetti (left) was responsible for the arrangements of the meeting. He was assisted, amongst others, by university student Francesca Radaelli (right).



The 1990 meeting of the Bureau took place during 23–24 September in Milan, Italy. In the following paragraphs, it is my intention to report on some of the Bureau's discussions which may be of interest to readers of these pages and to raise other relevant matters which will require attention in the near future. Some items were dependent on decisions taken subsequently at the International Council of Scientific Unions (ICSU) General Assembly which followed shortly afterwards.

The Bureau heard from Vice-President Prof. Allen Bard (USA) of his preliminary statutory critical

assessment of the work of the seven divisions and the Section on Medicinal Chemistry. Following the Bureau meeting he had detailed discussions with each division/section president individually in continuation of the assessment.

The finalized version of the assessment will be distributed to the NAOs and discussed by the Council in due course. At the time of writing this column, NAOs and the Executive Committee have not seen the finalized version of the assessment and so it would be inappropriate for me to discuss it here. However, there is one item which has surfaced

in practically all previous vice-presidential critical assessment, including this one, and that concerns the several projects which still remain incomplete after a period of 10 years.

In the light of some recent developments in IUPAC's overall programme, this continuation of over-10-years-old programmes may no longer be tenable. I refer of course to the introduction of the new mission-orientated programmes, two of which are now in position.

These latter programmes require finance in addition to the traditional or core activities of the divisions. Happily, it has been possible to initiate the first two of these from a fortunate and timely accumulation of financial assets at the disposal of the Treasurer. I use the word 'happily' because, by virtue of the availability of these uncommitted assets, we were immediately able to provide the initial funding for them without the need to withdraw money from the routinely planned divisional/sectional programmes. However, it is axiomatic that the future activity in both these mission-orientated programmes cannot continue to be funded from such assets. The latter are now fast vanishing because of these and other essential calls up them such as the need to refurbish the Secretariat to provide reasonable working conditions for the Union's permanent staff and to keep their office equipment sufficiently modern to be able to communicate efficiently with IUPAC chemists and with other international organizations.

Nobody wants to see the core activities of the divisions reduced by any significant extent. However, since the IUPAC budget will in future have to finance these two different types of activity there will obviously need to be some rationalization between them unless additional funding can be provided by the NAOs. At present this seems to be unlikely. It would appear, therefore, that the Union may have to conclude that the first thing to be trimmed may be those programmes that are now over 10 years old.

Division committees and commission officers who have not paid much attention to the 'gale

warnings' that have been issued biennially for the past few years by successive vice-presidents may not find that the storm has at last broken. If I may indulge in the language of my seafaring ancestors, these over-10-year-old programmes may be 'lost with all hands' unless they can be brought safely to harbour by the time IUPAC reaches its General Assembly in Hamburg.

Such a decision to abandon hope for all such overdue programmes would almost certainly have to be taken uniformly. It would be very difficult to decide to continue to support some with scarce divisional funds and personnel resources and not others. After all, as has been said by many people over and over again, 10 years is surely enough to complete any particular IUPAC programme.

At the same time, faced with such unpleasant action and others that may follow, divisions and commissions are certainly entitled to ask that the Union, in the light of its experience, thus far, should also examine the implications for IUPAC as a whole of committing further resources to mission-orientated programmes. Some may wish to challenge that so much money should be presently committed.

Some readers may wonder why we introduced these mission-orientated programmes which are likely to lead to some reduction in the core activities of the Union and cause upset to many people in the divisions who have supported its work so ably in the past. This topic was debated at considerable length within the Bureau in 1986-7, before it was concluded that IUPAC had to have the flexibility to engage expeditiously in programmes of vital interest to the world community.

The present entirely divisional structure of the Union did not allow sufficient freedom to respond within a reasonable time to topics such as chemistry and the environment, chemistry and advanced materials, chemistry and the biosciences/biotechnology, chemistry and energy supplies and so on. People and organizations outside expressed surprise that our Union was seen so often not to have taken action on concerns of vital interest to the public.

Other unions were much more responsive than IUPAC and were for, for example, participating in 'global programmes' on various topics. Increasingly we were isolated by our apparent inertia and predetermined programmes which seemed to sail on imperturbably and unconcerned into the blue yonder. Yet the outstanding success of the CHEMRAWN (Chemical Research Applied to World Needs) activity showed what IUPAC could do by exercise of some forethought.

One possible way, therefore, was to repeat the eminently successful CHEMRAWN experiment. The latter at the time caused a great deal of upset to the divisions because of the diversion of funds and it



The Bureau meeting in progress.



Meeting of Division/Section Presidents in Triuggio 22nd September 1990.

was partly as a consequence of this that the Union decided to set up the mission-orientated programmes interdivisionally to ensure that as much as possible of the Union's expertise could be brought to bear on these programmes on an integrated basis within the divisions. However, the upset consequences were foreseen and in the light of ongoing experience these should now perhaps be monitored and debated to ensure that we are following the best course.

Chemistry and the Environment Programme

Set up in 1989 at the Lund General Assembly, this programme is now well underway. Its coordinating committee, COCEP, has met twice. A booklet entitled *Chemistry and the Environment: The IUPAC Programme* has been published and widely distributed both within and outside the Union. It summarizes what has been achieved hitherto in an unstructured way — by chance as it were.

COCEP has four divisions engaged in its work: Physical Chemistry, Analytical Chemistry, Applied Chemistry and Clinical Chemistry. It has programmes running on the development of analytical procedures for the detection and determination of environmental contaminants, the transformation of chemical substances within the environment, the toxicology of natural and synthetic substances, the measurement of physico-chemical parameters under environmental conditions and, very impor-



The Coordinating Committee on Chemistry and Advanced Materials meeting in Triuggio.

tant indeed, the prevention of environmental pollution using chemical and biochemical methods.

In Milan, COCEP discussed the funding of planned and ongoing activities, contacts to be made and maintained with, for example, ICSU-SCOPE (Scientific Committee on Problems of the Environment), and UNEP (United Nations Environment Programme). It is possible that COCEP might have made considerably more progress at Milan had it not been for the sudden indisposition of its chairman, Acad. V. A. Koptug, immediately before the meeting. However, I am happy to report that he is now well and has, with the President, re-established our contacts with SCOPE and UNEP.

Chemistry and Advanced Materials Programme

The Coordinating Committee on the Chemistry and Advanced Materials Programme (COCAMP) met for the first time in Milan under the chairmanship of Past-President C. N. R. Rao (India). The divisions involved are Inorganic Chemistry, Organic Chemistry, Macromolecular and Physical Chemistry. COCAMP has also requested the participation of the Analytical Chemistry Division.

Being its first meeting, COCAMP spent some time discussing existing programmes of the Union that fall within its remit and, of course, planning its future strategy. It was agreed that a booklet should be prepared similar to the one for Chemistry and the Environment mentioned above, which would summarize the present IUPAC position, and be generally useful within and outside the Union. It also agreed to produce a monograph on advanced materials in the series *Chemistry for the 21st Century* with Prof. Rao as editor. Some workshops or symposia are to be planned on the chemistry of advanced materials and a continuing programme with the IUPAC Committee on Teaching of Chemistry (CTC) to introduce advanced materials concepts to the teaching of chemistry.

Some of the 'buzz words' being circulated round the first meeting of the committee may be of interest to readers: for example, oxide superconductors, high-temperature adhesives, high-performance polymers, biocompatibility of materials, composites, functional polymers, fast ionic conductors, integrated-circuit materials, and reactivity of solid phases.

Off to a good and energetic start, COCAMP plans to hold its second meeting in August 1991 in Hamburg at the General Assembly of possibly earlier if funds can be made available.

COCI conference safely home

The Committee on Chemistry and Industry (COCI) 1st Workshop on Safety in Chemical Production (Basel, Switzerland, 9-13 September 1990) held



The Cardinal of Milan in conversation with IUPAC President Yves Jeannin.

Address by Cardinal of Milan

The Cardinal of Milan, Carlo Maria Martini, addressed Bureau members during their meeting at Villa Sacro Cuore in Triuggio. He said that although he could not read the research papers of chemists he and other members of the community certainly benefitted from research in chemistry. He added that he was pleased to address members of IUPAC since the organization was concerned with peaceful cooperation through science.

The Cardinal was attending a Milan diocesan meeting at Triuggio. Villa Sacro Cuore, which is owned by the Diocese of Milan, is often for such meetings.

shortly before the Bureau meeting was judged to have been a considerable success particularly in imparting 'hands-on' experience to production chemists from the developing world. The latter were brought to the workshop at the expense of the organizing committee which secured the necessary funding from chemical and related industries. There

were of course many chemists from advanced countries also participating in the activities.

A repeat workshop has been planned for early 1993 in Yokohama, Japan with a greater orientation to environmental issues. Subsequently, COCI proposes to have the workshops repeated in developing countries.

This COCI workshop marks a quite startling departure for IUPAC — a completely new initiative on industrial chemistry. It is a pleasure to pay tribute to the Chairman and Secretary of COCI, Dr Dieter Wyrsh and Prof. Albert Fischli (both Switzerland) and also to the members of their committee for their hard work and successful achievement.

Affiliate Membership Programme

The newly formed Committee on Affiliate Membership (CAM) met for the first time immediately before the Bureau meeting in Milan. It reviewed its terms of reference, the history of development of the

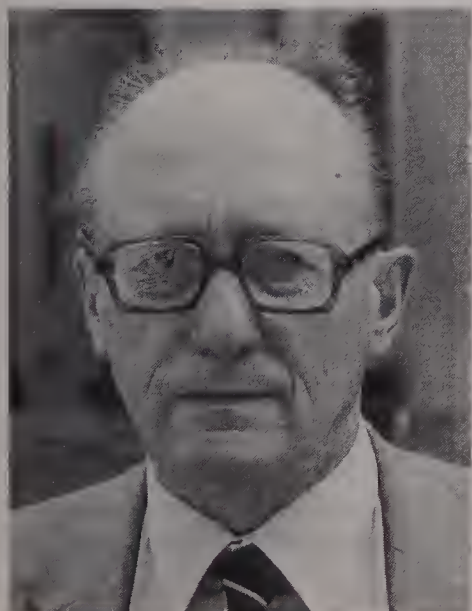


The COCI workshop in Basel was a startling departure for IUPAC and a considerable success.



programme and the present position of affiliates within IUPAC.

The results of a survey of affiliates in the USA conducted by the US National Research Council/National Committee for IUPAC were tabled and discussed by CAM. It appeared, encouragingly, that many chemists in the USA had joined because they felt that they should support their international union rather than because of any personal gain they might thereby achieve. However, it was noted with satisfaction by the committee, from information presented by the IUPAC Secretariat, that several affiliates had indeed been elected to membership of commissions and committees. Some ideas were discussed on how this situation might further be improved but the overall picture was complicated because essentially the affiliate membership details are kept by the national chemical societies rather than by IUPAC, so that for some countries the Secretariat is not informed of the names and addresses of their affiliates.



Bureau member
Prof. Mihály Beck
(Hungary) is one of
the members of
CAM.

One suggestion developed immediately for recommendation to the Bureau was the automatic provision of some much sought after documentation. Starting in 1991 it was proposed that all affiliates joining or rejoining should be provided with a membership card, a certificate of membership and a copy of the laminated card carrying the abbreviated list of IUPAC recommended units and symbols from the 1988 edition of the 'Green Book' of the Physical Chemistry Division. It is hoped to put this into effect around mid-1991. Several other proposals were approved in principle but need further discussion and development within the committee and subsequently other bodies of the Union. It would be inappropriate to discuss these here but affiliates should rest assured that CAM has their interests within IUPAC very much at heart and that it intends to pursue matters vigorously.

I appreciate that notification of the formation of CAM at the General Assembly in Lund in August 1989 may have escaped the attention of many

affiliates and that the request for ideas to be discussed by CAM arrived too late due to publication schedules. Nevertheless, we discussed all the matters that had been raised previously by correspondence and we now invite new submissions to CAM by affiliates in time for the CAM meeting at the General Assembly in August 1991. Please write to me (Prof. Tom West) c/o Affiliate Affairs Secretary at the address of the IUPAC Secretariat given in the 'Information for Affiliates' section on page 83. How can we help your interests in IUPAC? What would you like IUPAC to do for you as an affiliate member? What would you like to do for IUPAC?

Relations with ICSU

COBIOTECH. The previous column (*CI*, Vol. 12, No. 6, pp. 224–5, 1990) reported on the meeting of the IUPAC Executive Committee in Athens 1990. In that report I discussed our relations with ICSU and referred to some problems that seemed to be developing for us. These views of the Executive Committee were endorsed by the Bureau in Milan and had previously been communicated to the ICSU Scientific Committee on Biotechnology (COBIOTECH) which met before the Bureau meeting.

I am happy to report that COBIOTECH appreciated our concern at its meeting in June and accepted the IUPAC representative *ad hominem* as a full member of its steering committee so that in future we will be fully informed once more of COBIOTECH's thinking and better able to contribute to the process.

CASAFA. The ICSU Inter-Union Commission on the Application of Science to Agriculture, Forestry and Aquaculture did, as forecast earlier, become a new scientific committee of ICSU at the latter's General Assembly in Sofia during October 1990.

Our views on the essentiality of IUPAC remaining in close contact with its were communicated to the meeting of CASAFA and we will await developments when the first (nominated) CASAFA Steering Committee begins to elect its own membership in future. It certainly seems that any ICSU body that is discussing the future of sustainable agriculture should keep in close touch with the chemistry union. Without chemical inputs the world will most certainly not be able to sustain its present, let alone its future, population.

Chemical weapons. At our General Assembly in 1989, the IUPAC Council noted a letter from the Greek NAO that the Union should make a public statement on its attitude to chemical warfare. The Council decided to ask ICSU to broaden the issue to cover all weapons of mass destruction such as nuclear, biological and chemical and to involve its constituents unions accordingly.



Any ICSU body that discusses the future of sustainable agriculture should keep in close touch with chemistry's union.

The request was transmitted to ICSU, but the General Assembly of the latter did not occur again until the week after our own Bureau meeting in Milan. However, I can report that ICSU has now referred the matter to its Executive Board for attention. Its ethical committee had become defunct in the interim.

Were it simply a matter of IUPAC making a public statement of opposition to the use of chemical weapons there would be no difficulty as our Council agreed in Lund. However, much more than that is necessary to influence public thinking and consequently governments.

It would require very considerable input to produce a thoroughgoing exploration of all the issues involved, for example, from the ethics of production and use including the role of individual scientists in researching, developing, manufacturing and testing, to their immediate and long-lasting physiological, psychological and physical consequences for humanity and the animal and plant world.

Clearly this would be a gigantic undertaking and one in which our Union should be prepared to play a part. To a large extent, ICSU already has a model and experience in its Environmental Consequences of Nuclear War (ENUWAR) project. This was a promising start which attracted much public support.

In the next issue I shall give a general report on the outcome of the 1990 ICSU General Assembly principally in relation to its implications of IUPAC.

Election time in IUPAC

In drawing this column to a close I would like to take this occasion to remind all IUPAC chemists that election time is approaching and that they have vital interests in the outcome. I am referring to the elections for all the IUPAC officer positions and of elected members of the Bureau specifically, but of

course there will be elections in every division and most commissions.

Vice-President Allen Bard (USA) will become the president in succession to Prof. Yves Jeannin (France) who will assume the position of past-president on the Bureau and Executive Committee. Thus, there will be a need to elect a new vice-president/president elect in 1991. Both the Treasurer, Prof. Anders Björkman (Denmark) and myself — the Secretary General (UK) — retire having served the maximum period in office. There will therefore be vacancies for new officers of the Union in every position. There will also be a need to elect at least four new members of the Bureau.

Holders of the officer positions in recent years have come from the following IUPAC member countries:

Vice-President/President Elect

1989–91	USA
1987–89	France
1985–87	USSR
1983–85	India
1981–83	Canada
1979–81	Japan
1977–79	Switzerland
1975–77	Belgium
1973–75	USA
1971–73	UK
1969–71	France
1967–69	Australia
1965–67	USSR
1963–65	FRG

Before 1963 the office of president usually ran for 4 years.

Secretary General

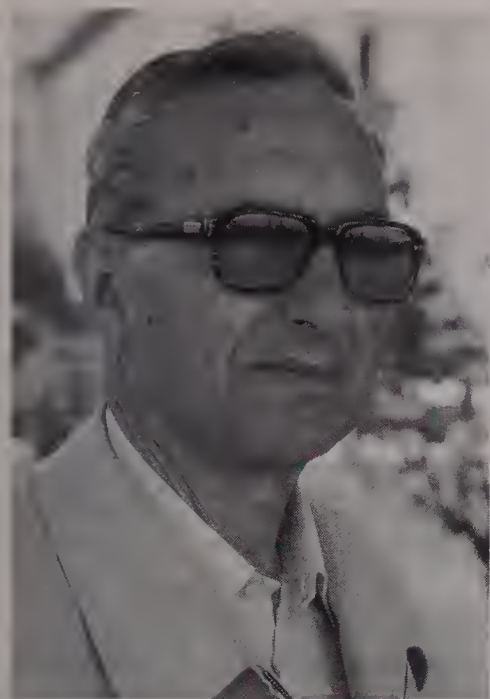
1983–91	UK
1975–83	France
1971–75	Canada
1955–71	Switzerland
1946–55	France
1920–40	France

Treasurer

1984–91	Denmark
1979–83	FRG
1971–79	FRG
1963–71	USA
1957–63	UK
1947–57	UK

Present (continuing) elected members of the Bureau come from Australia, China/Beijing, Japan, Sweden, USA, and USSR.

This means that no new elected members can be proposed for 1991–93 from the six named above member countries.



Prof. Alex Arvia (Argentina) will retire as a member of Bureau at the Hamburg General Assembly.

Present elected members from Hungary, Israel, Italy and UK who are due to retire in 1991 are eligible for election for a second period of office.

The elected member of the Bureau from Argentina due to retire in 1991 will have served his maximum period of office and cannot be re-elected again in the same capacity.

By statute, no NAO may have more than one elected member of Bureau at any one time. In this context the nationality of the officers and the Past-President serving on the Bureau is without significance, that is, an NAO may have an elected member of the Bureau and an officer. Similarly, the nationality of the division presidents, who serve *ex officio* on the Bureau, is also of no significance. Their nationalities will nevertheless be announced to the Council as soon as they are known before the elections.

Commission & Committee News

New projects in solid-state chemistry

Trinity College Dublin hosted this very well-attended gathering of the members of the Commission on High Temperature and Solid State Chemistry from the 17th to the 18th August 1990. The meeting received reports from the Inorganic Chemistry Division and from the IUPAC Executive Committee and discussed, in particular, its involvement in the contribution to the 'Chemistry and Advanced Materials' initiative.

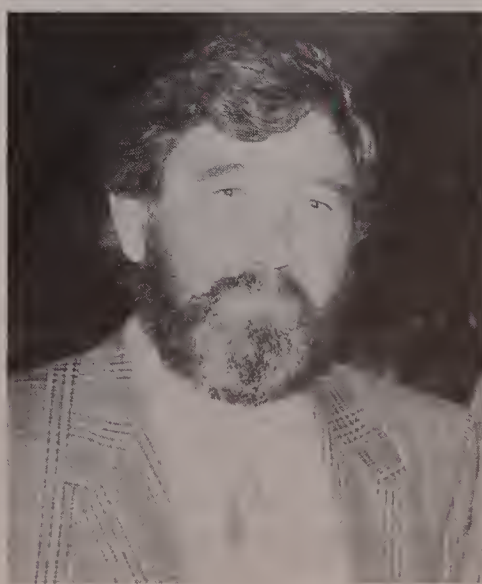
A range of suggestions in relevant areas had already been formulated and forwarded to the coordinating committee (CCCAMP). Members of the commission, in noting the Interdivisional *ad hoc* Committee on Solid State Chemistry, chaired by their own chairman, urged that there should not be a proliferation of interdivisional committees with closely related purposes.

The new projects which were undertaken by the commission at Dublin reflect very much the new directions indicated by these initiatives. Two task forces will be concerned with terminology: the first with that for the kinetics of solid-state reactions and the second with that for silicon nitride ceramics.

Two preliminary survey teams were also initiated to examine the teaching of high-temperature chemistry and to investigate high temperatures in ceramics processing, respectively. In addition, the work in which the commission had been engaged in the area of the teaching of solid-state chemistry at second and third levels was consolidated into a single task force.

The commission reviewed all its ongoing projects including collaborative study programmes on ionic conductivity of fluorite-structured solids and on the determination of glass compositions using EMPA, the first phase of which has now been published in *PAC* (Vol. 62, pp. 1187–92, 1990). The subcommittee that has been working on the terminology and characterization of carbon presented a further report which has been forwarded for publication through the procedures of the Interdivisional Committee on Nomenclature and Symbols (IDCNS).

Another paper, containing definitions of terms relating to phase transitions in the solid state, was sent to the Division president. The commission's high temperature bibliography was also published during the year.



Prof. John Corish is Secretary of the Commission on High Temperature and Solid State Chemistry.

Satisfactory progress was recorded in the remaining projects — several of which are long-term in nature. These will produce significant publications in the near future. They include work on high temperature mass spectrometric ionization cross-sections and on high temperature thermochemical data of the elements, both of which will be made available on diskettes.

The commission also discussed plans for its next topical Conference on High Temperature Materials Properties which is scheduled for Orleans in June 1991.

John Corish

Structure-reactivity parameters

The Commission on Physical Organic Chemistry (III.2) met in Neve Ilan, Israel, 10–13 August 1990. Encouraged by the positive reaction from the community concerning the need for and feasibility of the commission project on structure-reactivity parameters and equations, a working party, chaired by Prof. J. Shorter has undertaken a comprehensive study designed to evaluate critically substituent constants and correlation equations.

Structure-reactivity parameters and equations are widely used to predict structural influences on reactivity in basic and applied areas of the chemical sciences. Emphasis will be given to electronic substituent parameters derived from well-defined reference systems. Steric substituent parameters will also be accumulated. It is expected that the working party's critical compilation will guide current and future applications of this widely used methodology.

The revision of the widely used 'Glossary of terms used in physical organic chemistry' is underway. Plans were approved to include terms commonly employed in bio-organic chemistry, instrumental methods of analysis in organometallic chemistry and other areas in the revised edition. Definitions will, as much as possible, be simple. Esoteric terms that do not have common usage will not be included. Terms currently in the glossary will be



Commission on Physical Organic Chemistry in Neve Ilan, Israel.

revised as appropriate to correspond to common usage.

New projects to develop the terminology for theoretical chemistry and modelling were discussed and their objections were formulated. 'Class names for reaction intermediates' has been incorporated into the 'Class names' document of the Commission on Nomenclature of Organic Chemistry (III.1) that is undergoing final revision.

The Commission III.2 meeting in Israel was held in conjunction with the 10th IUPAC Conference on Physical Organic Chemistry held at the Technion University in Haifa. The 11th conference will be held in 1992 in Ithaca, New York, USA.

Michael P. Doyle



New quality thrust proposed

The Commission on Microchemical Techniques and Trace Analysis (V.2) held its 1990 meeting at the Technical University of Vienna following the Euroanalysis VII conference. In addition, the Subcommittee on Surface Analysis and the Working Groups on Organic Trace Analysis and on Specification also held meetings.

Good progress has been made on a number of projects which were reviewed at this meeting, and the groups made plans for starting new projects to be approved at the next IUPAC General Assembly.

One of the major thrusts of the Working Group on Organic Trace Analysis is on trace analyses relating to the environment, and the Commission is making a significant contribution to the horizontal programme on environmental chemistry which is being undertaken by IUPAC. The new Working



Commission V.2 in Vienna.

Group on Speciation also had a fruitful meeting; it has a number of projects in progress and has submitted a project for divisional approval ahead of schedule.

The Commission was fortunate to have Prof. Gerrit Den Boef, President of the Analytical Division, present at the meeting as a guest. Den Boef gave the Commission valuable information on the present state and future directions of the Division and the Union to help the Commission proceed in the best possible manner.

One major new thrust for the Commission was discussed at this meeting, namely a new programme on the topic of quality assurance relating to analytical measurements. The Commission felt that this is a very timely issue and appointed a study group, which met in November, to produce a feasibility study for programme in this area, which will be submitted for approval by the entire Commission at the General Assembly.

David Westmoreland

Food chemistry

The Commission on Food Chemistry (VI.1), which met in Vienna last August, has made a special effort over the past year to encourage and foster collaboration between IUPAC and other inter-

national organizations, as well as to develop joint projects with other commissions within IUPAC.

This is evident in the collaborative studies of methods for mycotoxins, aquatic biotoxins, environmental contaminants and selected elements conducted jointly with other organizations such as the Association of Official Analytical Chemists (AOAC); in the aflatoxin international check sample programme co-sponsored by the International Agency for Research on Cancer (IARC); and in the cooperative project on lipid oxidation between the Working Group on Food Processing, Commission Food Chemistry and the Commission on Oils, Fats and Derivatives.

A new initiative by the commission involves the development of performance criteria for immunochemical methods (and in general screening methods); the commission hopes to seek the active involvement of other IUPAC commissions in this project.

In addition, the commission has established a formal relationship with the AOAC (Dr Pohland), WHO (Dr Park), CODEX (Dr McWeeny), BCR (Dr Vaessen) and IDF/ISO (Dr Vaessen). The purpose of these formal contacts is to foster information exchange and cooperative activities between the two parties.

Finally, the Commission on Food Chemistry, having been invited to Vienna as the guest of the Federation of European Chemical Societies Working Party on Food Chemistry, now has a good opportunity to establish a formal working relationship with that important group in the interest of food chemistry. It is the hope of the commission that this emphasis on international cooperation between organizations will be of value to all parties involved and enhance the support research efforts in food chemistry.

Douglas L. Park

PAC Review

Pure and Applied Chemistry (PAC) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Photochemistry of supramolecular species

The 13th International Symposium of Photochemistry was held at the University of Warwick, UK, 22–28 July 1990, under the chairmanship of Prof. F. Lewis (Northwestern University, Illinois, USA).

The plenary and invited lectures delivered at the symposium were published in the August 1990 issue of *PAC*. They included contributions from two affiliates: Vincenzo Balzani and Claude Loucheux.

Balzani's paper, which was co-authored by three colleagues from the University of Bologna and

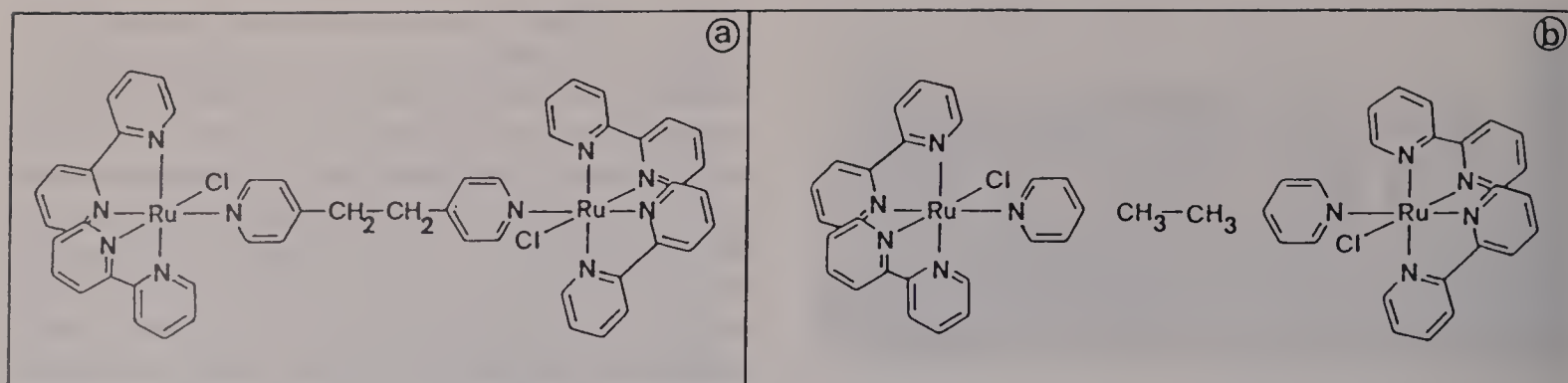


Figure. (a) A 'supermolecule' and (b) its components.

University of Ferrara, was entitled 'Photochemistry of supramolecular species'. The abstract of their paper points out that, as molecules are made up of atoms, supermolecules are made up of suitably arranged molecular components.

The authors add that investigations on the great variety of supermolecules that are now available because of the progress made by synthetic methods, offer the dual opportunity of broadening our knowledge of the fundamental principles of photochemistry and discovering new functions and applications of photo-induced processes. In their paper they review photochemical studies on some selected supramolecular species, including covalently linked components, ion pairs, host-guest systems, and cage-type complexes.

Affiliate Claude Loucheux and seven other chemists from Université des Sciences et Techniques de Lille Flandres. Artois co-authored a paper on 'Synthesis and properties of photoreactive polysiloxanes containing pendant functional groups'.

The French team prepared functional polysiloxanes containing photoreactive pendant groups by multi-step modification of silicone copolymers containing methylhydrosiloxane units. The first preparative method they used was based on the platinum-catalysed hydrosilylation of vinylsilyl-terminated photoreactive esters. This method permitted the preparation of liquid silicone polymers containing photo-dimerizable esters.

Another method was based on the esterification of pendant epoxy groups previously grafted onto the silicone main chain. They found this method to be a general and very powerful alternative route for the preparation of photoreactive polysiloxanes. They have applied the method to the synthesis of polysiloxanes containing various functional side-groups such as dimerizable esters, aromatic carbonyl compounds or dyes which possess properties of photochemical interest.

The team examined the reactivity, the ability to be photosensitized and also some practical properties of different photo-cross-linkable polysiloxanes, modified either by cinnamic, furacrylic or α -cyano- β -styrylacrylic ester groups. A kinetic investigation

of the reactivity of the polysiloxane-bound dimerizable chromophores demonstrated the effect of the silicone matrix in comparison with more classical hydrocarbon photopolymers.

Silicon device fabrication

Silicon chemistry is the foundation of silicon device fabrication. According to three scientists at AT&T Bell Laboratories, New Jersey, USA, the current need for this chemistry is so great that processes are designed and used with little knowledge about the nature of the reactions.

The three scientists, M. L. Mandich, W. D. Reents, Jr, and K. D. Kolenbrander, were the authors of a paper presented as a plenary lecture at the 9th International Symposium on Plasma Chemistry held at Pugnochiuso, Italy, 4-8 September 1989. Their paper and other symposium plenary and invited lectures were published in the September 1990 issue of *PAC*.

In their paper on 'Chemical properties of small silicon clusters' Mandich, Reents and Kolenbrander stated that the microscopic surfaces of small silicon clusters offer a model for studying chemistry at highly reactive silicon centres. Positively and negatively charged silicon clusters are prepared and reacted with a variety of reagents in the trapped ion cell of a Fourier transform mass spectrometer.

Prototypical etching and deposition reactions are observed which are analogous to the chemistry of activated silicon surfaces. These reactivities correlate with chemistry of two distinct types of dangling bonds in the clusters. Sequential reactions of bare silicon cluster and subsilane cations with silane also occur.

All of these clustering sequences, however, encounter early bottlenecks which prevent infinite growth to form large particles. Studies of the individual steps of these clustering reactions yield extensive information about nucleation under subsaturated conditions. These findings indicate that reactions of silicon cluster and subsilane cations with silanes do not lead to the formation of hydrogenated silicon dust in silane plasmas.

Etching

Etching was also the subject of an invited lecture by Daniel L. Flamm (University of California, Berkeley, USA) presented at the Pugnochiuso symposium. The title of the paper was 'Mechanisms of silicon etching in fluorine — and chlorine-containing plasmas'.

In the introduction of his paper, Flamm pointed out that circuit patterns are transferred to silicon by exposing surfaces of this material to the species formed in fluorine and chlorine-containing plasmas. He then discussed the elementary interactions of free halogen and halogen-containing species with silicon and connected them with the complex phenomena and chemical feeds which have been developed for use in semiconductor production lines.

According to Flamm, etching mechanism may be divided into four basic phenomenological categories: sputtering, chemical etching, ion-enhanced energetic mechanisms and ion-enhanced inhibitor processes (see Figure).

Sputter mechanisms include those in which material is mechanically ejected from a surface by the energy and momentum transferred in energetic ion bombardment. Virtually any material can be sputtered if the ion energy is high and the pressure is low enough for ejected matter to be thrown across the reactor with few collisions.

The remaining three mechanisms are fundamentally different from sputter removal in at least two ways: (a) *chemical* reactions are central to the etching process, and (b) the substrate is converted into *volatile*, gaseous products. Hence, unlike sputter etching, the other mechanisms do not depend on a long mean free path, nor is the amount of material removed sharply limited by the ion current to the surface.

Chemical plasma etching mechanisms are those in which the discharge creates uncharged etchant radicals which react with a surface material through

conventional chemical reactions. Although the plasma also contains charged particles, they do not participate in the 'chemical' etching reactions. Chemical etching is *often*, but not always isotropic (that is, non-directional).

Energetic ion-assisted plasma etching mechanisms remove materials that would not otherwise be gasified by plasma-generated species. Etching is made possible by the disruptive effect of ions bombarding a surface.

In the fourth category, an 'inhibitor' film induces anisotropy under circumstances where etching is spontaneous and the mechanism would ordinarily be purely chemical. With suitable plasma conditions, the ion flux (which is perpendicular to the surface) prevents the deposition and growth of inhibitor on horizontal surfaces, so inhibitor selectively deposits on feature sidewalls where it prevents attack.

Enzyme mimics

Enzyme mimics was the title of one of the plenary lectures presented at the 8th International Conference on Organic Synthesis held in Helsinki, Finland, 23–27 July 1990. The lecturer was Ronald Breslow (Columbia University, USA).

He pointed out that binding both ends of a substrate to a catalyst can lead to selective functionalization reactions, and also to very strong binding. Attachments of co-enzymes such as pyridoxamine or thiamine derivatives to binding groups produces catalysts that show enzyme-like selectiveness. When two functional groups are attached to a binding group the resulting catalysts are good mimics of enzymatic transaminases and ribonucleases. Studies on enzyme mimics show the importance of limiting the degrees of freedom in a catalyst, but retaining some flexibility.

His lecture and other plenary and invited lectures from 8th ICOS were published in the October 1990 issue of *PAC*. A total of 830 participants from 49

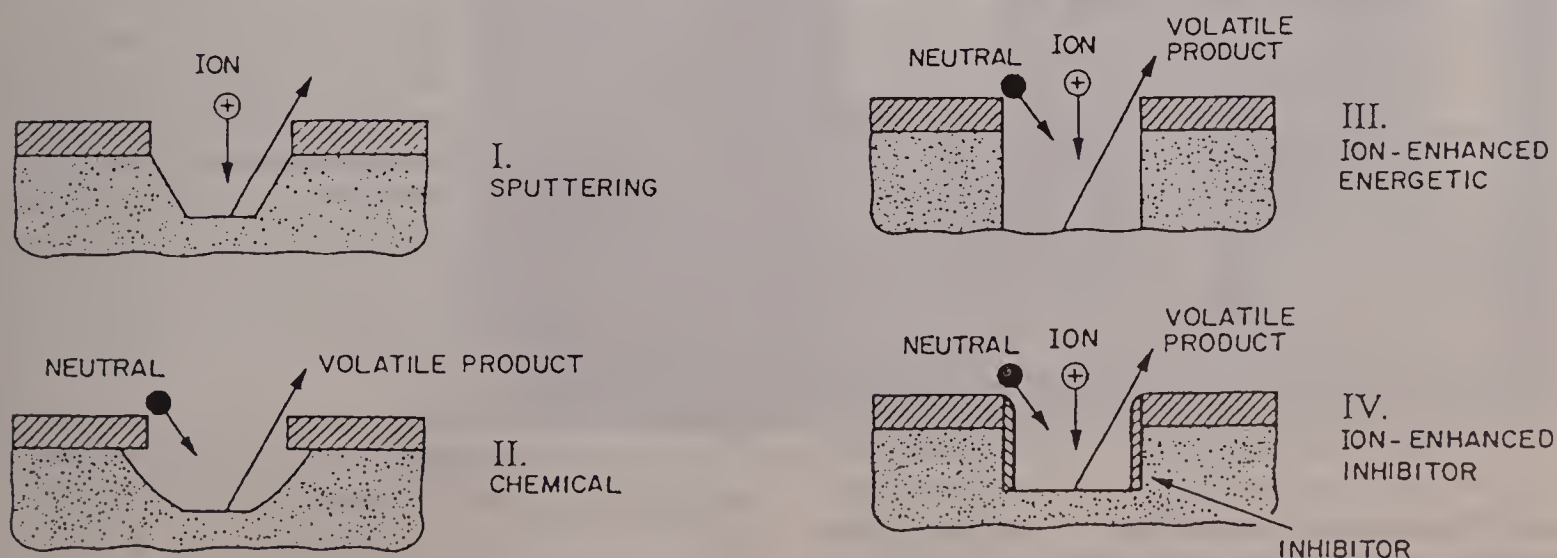
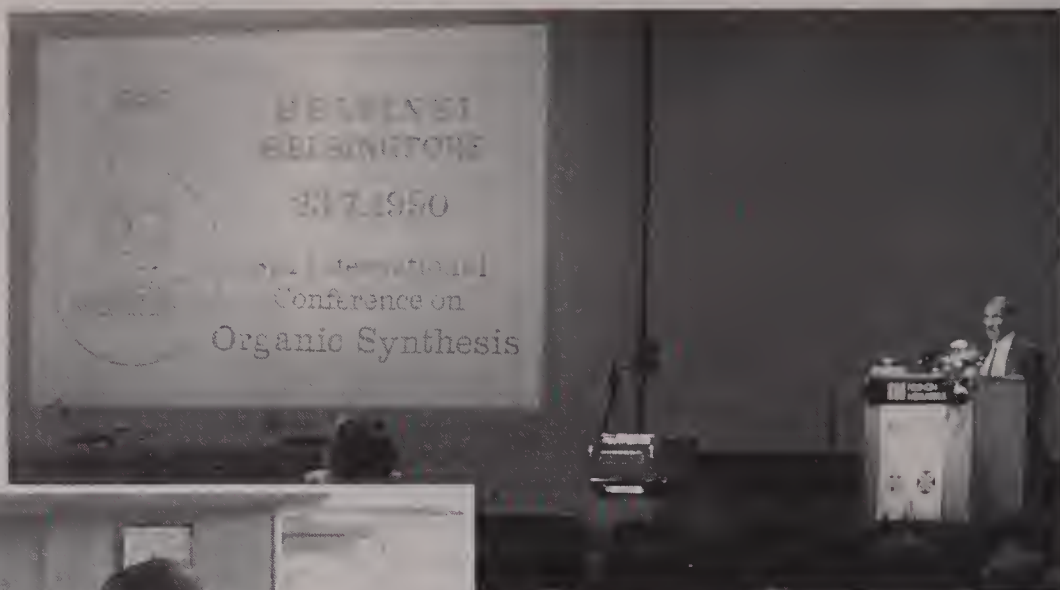


Figure. The 4 phenomenological etching mechanisms: I sputtering; II chemical etching; III ion-enhanced energetic etching; and IV ion-enhanced inhibitor etching.

8th ICOS Chairman Prof. Tapio Hase (left) in conversation with Symposium Secretary Dr Jorman Koskimies.



Prof. Irina Beletskaya, President of the IUPAC Organic Chemistry Division, was official IUPAC representative.



Over 300 posters were displayed at 8th ICOS.

countries attended the meeting. In addition to the lectures, some 44 oral short communications and 310 posters presented reflected the growing global importance of organic synthesis.

Psychobiological chemistry

Stephen Hanessian, Jonathan Franco and Benoit Larouche (Université de Montréal, Canada) co-authored a paper with the intriguing title 'The

psychobiological basis of heuristic synthesis planning — man, machine and the chiron approach'.

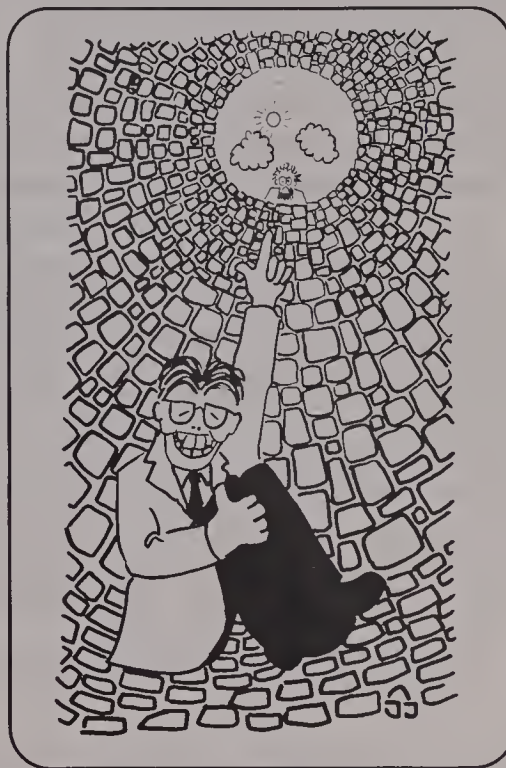
The Canadian team reviewed general strategies for the total synthesis of optically pure target molecules and emphasized the Chiron Approach which capitalizes on the use of chiral, non-racemic compounds as starting materials. The approach has been implemented in an interactive computer program which analyses functional and stereochemical features in molecules and carries out a search of suitable starting materials and precursors for synthesis from a database. The authors discussed the psychobiological basis of heuristic synthesis planning using notions of the human brain's bilateral asymmetry in the general context of the total synthesis of natural products.

In their introduction to the paper they commented that recent advances in biotechnology and other processes inspired from nature have enriched our science enormously, broadened our horizons, and deepened our vision for the future. Synthesis, they said, must take into account such amenities and a synthesis plan should consider *all* possible approaches regardless of their seemingly 'far off' nature. In this context they quoted Han-Yu (768–824):

'He (or she) who sits at the bottom of a well to contemplate the sky, will find it small.'

IUPAC affiliate Gary H. Posner (The John Hopkins University, USA) presented a plenary lecture at 8th ICOS on 'New synthetic methodology using

organosulfur compounds'. He showed that electron-deficient 3-sulfur-substituted 2-pyrones cyclo-add with high stereoselectivity to electron-rich vinylic ethers, vinylic thioethers, and 1,3-dioxoles under sufficiently mild conditions to allow isolation of the initial, bridged, bicyclic lactone adducts. These structurally and stereochemically rich bicycloadducts are easily converted into highly functionalized cyclohexenes as exemplified by high yield syntheses of chorismic acid, 4-epi-shikimic acid and also 1 α , 25-dihydroxyvitamin D₃.



Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions will be published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports.

If you would like to comment on these provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of national/regional centres appeared in *CI*, Vol. 12, No. 6, p. 228, 1990.

Terminology and conventions for microelectronic ion-selective field effect transistor devices in electrochemistry

In anticipation of the widespread use of *Ion-Selective Field Effect Transistors* (ISFETs) in

electrochemistry and analytical chemistry it is appropriate to make recommendations about terminology and presentation of results. The terms gate voltage, drain current and gate bias potential are defined and experimental techniques for measurements with ISFETs are summarized. The output signal is usually a potential difference whose magnitude varies with change in logarithm of sensed ion activity or concentration in the same way (but not necessarily in sign) as the corresponding ion-selective electrode (ISE). It is proposed that the graphical representation of results should be in accordance with previously made recommendations for ISEs, that is, that the output potential difference be plotted so that variation with increase of logarithm of activity, or concentration, has a positive slope for cation-responsive devices and a negative slope for anion-responsive devices.

Comments on the document are welcome and should be sent by 31st December 1991 to: Prof. A. K. Covington, Department of Chemistry, Bedson Building, University of Newcastle upon Tyne, Newcastle upon Tyne, NE1 7RY, UK.

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Radiolabelling of monoclonal antibodies with metal chelates

For nearly a decade, the monoclonal antibody (MoAb) technique has been regarded as an encouraging and promising approach which may lead to rapid advances in both diagnosis and therapy of human cancer. This paper deals with all the chemical aspects of the radiolabelling of MoAbs with metal chelates. It elucidates the selection of radionuclides to be used for diagnostic purpose and therapeutic use. It reviews all the bifunctional chelating agents used in labelling MoAbs with metal radionuclides, and the prime techniques related to the protein modification, that is, the coupling of MoAb and chelator, and the subsequent process of radiolabelling. Factors affecting tumour-to-normal tissue ratios are discussed. The comparative assessment of advantages and disadvantages of In-111 and I-131 labels is made.

This report was prepared for publication by Liu Yuanfang and Wu Chuanchu, Commission on Radiochemistry and Nuclear Techniques, Analytical Chemistry Division, and published in PAC, Vol. 63, No. 3, pp. 427–63, 1991.

Molar absorption coefficients of transient species in solution

When chemical systems are monitored by optical absorption, molar absorption coefficients are the physical observables that are central to any quantitative analysis of the experiments. Stable systems and systems that change slowly, while remaining homogeneous, present no particular problems, but transients can be troubling to analyse precisely. Transient species have been monitored extensively by absorption in the last few decades in conjunction with the wide-spread use of flash photolysis and pulse radiolysis. The current work concerned with transients produced by photolytic methods. The best characterized molar absorption coefficients of these transients are those associated with triplet–triplet transitions.

In the first part of this paper, the experimental conditions required to obtain accurate and significant absorbances are examined, along with some corrections to be used when the ideal conditions are not achieved. With some techniques, such as those

involving transient changes of the refractive index of the solution induced by the absorption of the transient species (mirage effect, light diffraction by transient-induced gratings, etc.), it is often quite difficult to calculate the corresponding value of the absorbance with reasonable accuracy. The second part of the paper is devoted to the various methods which may be used for measuring, calculating or evaluating the concentration of the transient species. The third and last part of the paper has a list of the absorption coefficients of several transient species which are proposed as reference materials. These may be used to check experimental set-ups or as references in relative measurements. The list of transients is mainly confined to excited triplet states.

This report was prepared for publication by R. Bonneau, I. Carmichael and G. L. Hug, Commission on Photochemistry, Organic Chemistry Division, and published in PAC, Vol. 63, No. 2, pp. 289–99, 1991.

Proposals for the description and measurements of carry-over effects in clinical chemistry (Recommendations 1991)

Carry-over phenomena occur both in manual and mechanized procedures and are often neglected in practice. They are observed even with the latest clinical chemistry analysers. The paper makes recommendations concerning the terminology of carry-over and its classification. The conceptual aspects of specimen-dependent and specimen-independent carry-over are outlined, and both the experimental determination and calculation of carry-over effects are described in detail.

This report was prepared for publication by R. Haeckel, Commission on Automation and Clinical Chemical Techniques (Clinical Chemistry Division) and Commission on Analytical Nomenclature (Analytical Chemistry Division) in collaboration with the Subcommittee on Analytical Systems (International Federation of Clinical Chemistry), and published in PAC, Vol. 63, No. 2, pp. 301–6, 1991.

A synopsis of the report was published as Provisional Recommendations in CI, Vol. 11, No. 3, p. 102, 1989. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of December 1989 were taken into consideration when preparing the final report.

Pesticide chemistry

In August last year, the 7th in the series of IUPAC—sponsored International Congresses of Pesticide Chemistry took place in Hamburg. Topics included chemistry and bioactivity of new synthetic compounds, biotechnology in plant protection, and environmental fate.

Introduction

The IUPAC-sponsored International Congresses of Pesticide Chemistry take place every 4 years. Since 1967, the host cities have been Vienna, Tel Aviv, Helsinki, Zurich, Kyoto and Ottawa. The 7th in the series was held on 5–10 August 1990 in the Congress Centrum Hamburg. It was promoted by Gesellschaft Deutscher Chemiker (GDCh). Siegbert Gorbach (Frankfurt, FRG) was Chairman of the Organizing Committee and Helmut Frehse (Leverkusen, Germany) Chairman of the Scientific Committee.



Hamburg: venue of the 7th International Congress of Pesticide Chemistry.

The congress focused on all aspects of the development and use of plant protection and pest control agents and covered ten main topics.

- Chemistry and bioactivity of new synthetic compounds
- Chemistry and bioactivity of natural products with crop-protecting properties
- Biotechnology in plant protection
- Modes of action and resistance
- Formulation chemistry and technology
- Metabolism and degradation
- Environmental fate
- Residues
- Exposure and risk estimation
- Registration and legislation

A half-day symposium, in which invited experts presented papers, was devoted to each of these topics. The topics were broken down into some 40 or so sub-topics with almost 800 poster presentations. A 90-minute workshop was held for each sub-topic. About 1900 participants from over 50 countries attended the congress.

The congress included three special events:

1. a lecture and panel discussion on the theme 'Green gene technology',
2. a symposium, held jointly with the Association of Analytical Chemists (AOAC) of the USA, on topics relating to quality assurance in the analysis of products used in crop protection; and
3. an open forum, involving members of the public, on the current question 'Health food with plant protection'.

On Monday 6 August, a press conference, moderated by Renate Anger (GDCh), was held at the congress. The panel consisted of Helmut Frehse, Siegbert Gorbach, Gerhard Jäger (Bayer AG, Leverkusen), Fritz Führ (Forschungszentrum Jülich GmbH, Jülich) and Peter Böger (University Konstanz).

The following three reports are based on papers distributed at the press conference.

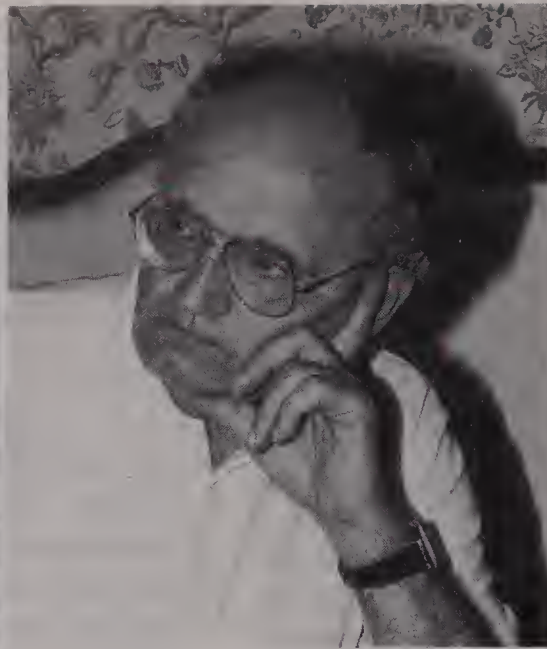
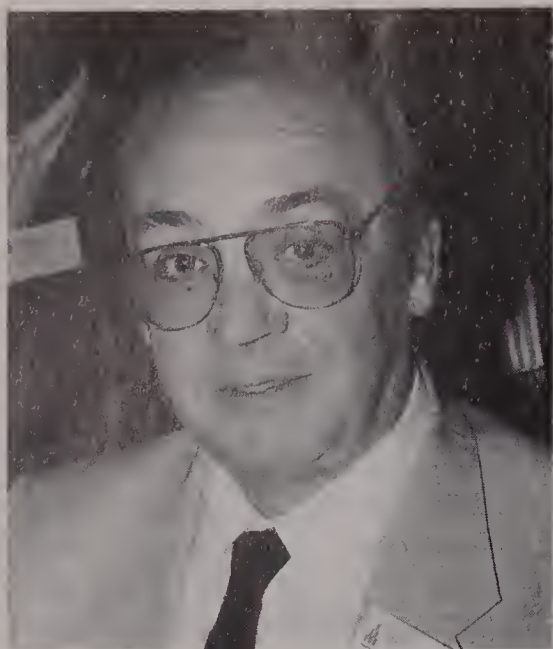
Chemical pesticide research

Safeguarding nutrition for a strongly and permanently growing world population in the presence of limited cultivation areas has for some time been one of the major challenges for science and technology. A number of measures will also in future be necessary to improve the world nutritional situation. The use of pesticides is indispensable to achieve this goal. Together with the introduction and improvement of other agricultural techniques they ensure that modern agriculture has the necessary crop yields.

Since its beginning some 50 years ago, chemical crop protection has made enormous progress. At present, pesticides must meet considerably higher demands than, for example, 15–20 years ago. Apart from the usual criteria for good biological action, which arise from the problems existing in agriculture, safety in the manufacture and use, and also favourable environmental properties of agrochemicals are foremost considerations. Ecological and economic objectives have the same priority as the development of pesticides.

The main targets for a modern pesticide include:

- a high, but target-oriented action against damaging organisms and at the same time a high tolerance for cultivated plants and beneficial organisms (specificity or selectivity);
- as low application rates as possible per area to reduce pollution and improve cost-effectiveness;



Helmut Frehse (left) and Siegbert Gorbach (right).

- rapid degradation of the active ingredient to avoid residues in soil, water, air, and crops;
- favourable toxicological properties of the active ingredients for the safety of manufacturers, users, and consumers;
- optimum, non-polluting application forms and the active ingredient (formulations), using ecologically and toxicologically acceptable carries and additives; and
- cost-effectiveness for manufactures and users as well as safety in transport, storage and application.

Moreover, there are several measures in connection with the practical use of these products, such as efficient and environmentally sound application procedures or the alternating use of different active ingredients to avoid the development of resistance.

Research and development costs

Research projects on pesticides are lengthy and cost-intensive processes, with a steeply increasing tendency. The growing economic and ecological pressure on agriculture has also changed the framework conditions for research.

The considerably more sophisticated and complex targets were grounds for research to develop new concepts for the discovery of active ingredients. For that reason some DEM 3 million were spent world-wide by research-orientated companies over the past 10 years, which represented the highest investment in research and development facilities of the entire history of crop protection.

The high increase in costs for the development of new, markedly better active ingredients resulted, during the same period, in about 24 new company mergers or acquisitions in the pesticide field, with originally about 30–40 pesticide manufacturers world-wide. Small and medium-sized companies are no longer able to bear the research and development costs alone.

New active ingredients

The chemistry and biological action of new synthetic compounds and natural substances were two central topics of the congress. New insecticide, fungicide and herbicide active compounds were presented, and new synthetic building stones and methods of synthesis discussed. Progress in the manufacture of chiral active ingredients was in the foreground, because the application volumes are to be reduced in the area of crop protection. A chiral active ingredient actually contains molecules which, with the same empirical formula, are not absolutely identical like images and mirror images. If only one type of molecule is active it is not necessary also to produce the other one. Research on synthesis seems to be getting a grip on these more sophisticated production methods.

Another important subject concerned strategies and concepts for the discovery of new active ingredients. This included, for example, the use of quantitative structure–activity relationship (QSAR) and the use of computer-assisted molecular modelling (CMM) in modern active ingredient planning.



Modern pesticides must be cost-effective for both manufacturers and users as well as safe to store, transport and apply.

CAMM belongs to the most recent instruments of modern active ingredient research. It is a system with manifold uses which was introduced into research laboratories during the 1980s, as a result of the dramatic development of computer graphics systems. With appropriate computer programmes and knowledge of receptor structures (for example, proteins) it permits a pictorial and computational simulation of possible real 'receptor docking' structures, the exact molecular integration of an active ingredient at a specific place of the site of action.

QSAR is a statistical method which had already been used for some time but has been refined over recent years. By linking experimentally determined chemical and biological data it attempts to predict computationally optimum structures of an active ingredient within a specific bioactive substance group.



An important source for new active ingredients is the immense reservoir of natural substances.

A further strategy in selective active ingredient search is the 'biorational approach' in which biological considerations prevail. In this approach, knowledge of biochemical processes and the molecular biology of plants and other organisms is used to synthesize, in a selective and specific way, inhibitory substances for these biological processes. Corresponding examples include substances which prevent photosynthesis in an undesired wild herb or inhibit the biosynthesis of sterol in fungi. The primary objective of all of these strategies is the theoretical preselection of the most useful structure in molecular terms in order to save synthesis work for innumerable, less useful compounds.

An important source for new active ingredients is the immense reservoir of natural substances, biologically active metabolites of microbial, plant and animal origin. Natural substances have in many cases the advantage that their biodegradation occurs rapidly in the biocycles. They therefore serve as models to produce mimetics (Mimics); these are substances in which the original properties of natural models have been optimized. For the group of insecticide pyrethroids the pyrethrum occurring in some chrysanthemum flowers, which is effective against insects, serves as biological model. Increasing knowledge about the biological functions of natural substances as signal, regulatory, and defence, substances provides many starting points for new principles in crop protection.

Chemical crop protection currently receives much criticism. Fear, distrust and a sinking acceptance by the general public often mask the achievements made and the perspectives of the future. The results presented at the congress showed possibilities for ecologically safe and economically reasonable solutions in agriculture. The extent to which an increased and methodologically improved use of biotechnological processes and genetic engineering methods are to supplement or replace pesticide chemistry was clarified during a workshop entitled 'Crop protection chemicals and biotechnology: allies or adversaries?'

Gerhard Jäger

Biotechnology in plant protection

Beer brewing, wine fermentation or cheese production is biotechnology in a broader sense. Today this term is associated with genetic engineering of viruses, bacteria, plants and animals to modify their properties and to make better use of them.

A gene is a defined fragment of the filamentous DNA molecule which carries the information as to how a protein molecule is synthesized. The genes in total form a genome, i.e. information of all inherited properties, organized in the cell as one or more chromosomes. DNA fragments (genes) are excised from the chromosomes by specific restriction enzymes, and can either be transferred directly into a cell (transformation) or 'cloned' with the help of plasmids. These are extrachromosomal genetic information elements, which propagate in the cell up to high copy numbers and are able to produce those proteins for which they carry the respective genes in higher amounts.

It is possible to integrate into plasmids certain genes, for example, for interferons, insulin, blood-coagulation factors or enzymes, and to transfer (by conjugation) the plasmids into appropriate host bacteria (for example, *Escherichia coli*) using them as producers of proteins for industrial or therapeutic purposes.



A complete plant can be regenerated from a single cell or a laboratory cell culture. (Photo courtesy Hoechst AG/Walter Kloos.)

A most interesting potential for genetic engineering is present in the plant kingdom. In contrast to animals, a complete plant can be regenerated from a single cell of a laboratory cell culture. Such a plant contains the genetic information of the original single cell, which can be modified genetically or new genes be introduced using *Agrobacterium tumefaciens*. This soil bacterium houses a plasmid (Ti-plasmid) which is able to confer a part of its DNA (T-DNA) to the plant genome. By cell division the T-DNA is propagated to the next cell even though the bacterium or its plasmid have disappeared.

Direct methods are also feasible, like micro-injection of DNA or bombardment of cells with tungsten microprojectiles coated with the desired genes (biolistic method). Through these methods plants may integrate bacterial, plant or animal genes. Furthermore, isolated genes can be mutagenized beforehand, changing the properties of the proteins they encode.

The amount of storage proteins or enzymes in the plant cell may be considerably increased (gene amplification, overexpression). Such 'transgenic' plants function as bioreactors, which produce new proteins either for therapeutic or nutritional needs. The physiological quality of plant proteins, often unsatisfactory for nutrition, may be improved by genetic engineering. To extend arable land into warmer and more arid areas, genes for temperature-resistant enzymes or drought-stress proteins could be cloned into crop plants.

Green gene technology

By conventional plant breeding, complete genomes — thousands of Mendelian traits — are mixed by crossings and separated again. New genes come into play only from other varieties or races. The species border severely limits the crossing procedure.

The 'green gene technology' only transfers DNA fragments and different species are no obstacle to mixing their genes. Furthermore, new genes normally not present in a plant (for example microbial ones) can be conferred permanently into the plant genome. This technique has made considerable progress. The genes are not expressed in all cells, only in certain tissues and developmental stages. This is important when, for example, the interplay of plant hormones influenced, and the induction of flowering or ripening of the crop is changed according to climate conditions of different crop-producing areas.

Fascinating prospects show up in plant protection. Genes are known for certain antifeedants. When these are cloned into plants they endogenously produce their own insecticide, making spraying procedures, with their inevitable impact to the environment, obsolete. Harmless virus genes introduced into the plant genome may result in immunization against pathogenic viruses.

Enzymes controlling key metabolic routes can be modified yielding a decreased binding capacity so that certain herbicides do not inhibit them. A modified gene for enolpyruvyl shikimate phosphate synthase (EPSPS) has been introduced into soybeans, or crops have been generated with a



The development of herbicide-resistance crops will ensure the use of less but optimized compounds. (Photo courtesy of UNATIONS.)

'resistant' acetolactate synthase (ALS), both key enzymes in the biosynthetic pathway of essential amino acids, the building blocks of proteins. Such a crop is resistant to certain herbicides but the weeds in the field are not.

Another herbicide, inhibiting glutamine synthetase, can quickly be inactivated by chemical modification in the cell. Accordingly, a bacterial enzyme catalysing the inactivating acetylation of the herbicide was introduced into soybeans, rendering them resistant to the corresponding weed control agent.

Obviously, in the long run, development of herbicide-resistant crops will ensure the use of less, but optimized compounds. In this respect, lower doses than applied before are important, as is the absence of toxicity to warm-blooded animals, and less mobility or better decomposition in the soil. Some agrochemicals matching ecological needs are available, but a broad spectrum of their application is missing. Lack of resistance limits the use of one herbicide for several crops.

One remark on the danger of gene technology. The Hamburg Congress discussed how far genetic engineering may be allowed to go. In this respect, the problem of an increased spread of resistant weeds, or the uncontrolled release of genetically modified but unwelcome strains into the environment deserves consideration. It should be noted, however, that transgenic plants, as far as we know today, will not propagate uncontrolled, eventually becoming a pest. A 'genetically created' new crop plant is a sophisticated piece of nature, like its original parent strain, and will badly need care and shelter by modern agronomy.

Peter Böger

Environmental fate

As has been observed during the last three congresses, held in 1978 in Zürich, 1982 in Kyoto and 1986 at Ottawa, the topic 'fate of pesticides in the environment' has received increasing attention. This year at Hamburg about 120 poster presentations contributed to this main topic.

This congress topic contained three sub-topics that dealt with the behaviour and fate of pesticides in the three environmental compartments of air, soil and water, followed by a fourth which was concerned with modelling approaches and experimental systems that include combinations of the various components. The idea was that the first three sub-topics reported methods and measurements which generate the information needed to develop and assess the integrated experimental systems and models that were the subject of the fourth.

Dissipation, transport and transformation in air

The papers concerned with transport mostly dealt with methods of measuring volatilization and relations between volatilization and chemical properties of the pesticide. One paper reported measurements of compounds actually found in the atmosphere. The second group of papers reported studies of reactions in the vapour phase, mostly photochemical reactions, which reflect the increasing realization of the importance of the atmosphere as a place where organic chemicals occur but where they are also decomposed.



A comprehensive review of the processes affecting loss during application and pesticide input into the atmosphere and the fate and behaviour of pesticides in the air included reference to the occurrence of traces of pesticides in rain and snow.

The paper by Majewski and the late Dwight Glotfelty provided a comprehensive review of the processes affecting loss during application and pesticide input into the atmosphere and the fate and behaviour of pesticides in the air. It included reference to the occurrence of traces of pesticides in rain and snow. Post-application volatilization from the field can represent a significant input to the lower atmosphere, but over a much longer time period. Field evaporation rates depend on how chemicals are applied, the formulation type, (emulsifiable concentrate, wettable powder, granular), whether they are incorporated or surface-applied and the prevailing meteorological condition. Surface-applied chemicals have a greater potential for evaporation than incorporated ones because the latter must migrate to the soil surface by diffusion or be transported to the surface with upward water movement.

Turnover, residence, long-term behaviour and effects in the terrestrial environment

The major emphasis of this sub-topic was demonstrated in over 60 contributions reporting on the persistence and mobility of pesticides in soil from the points of view of both pesticide performance and potential for entering water sources. There were also a number of papers that considered microbiological aspects of pesticide degradation, particularly with respect to the induction of microbial adaptations with enhanced abilities to achieve these adaptations.

Over one-quarter of the papers described lysimeter techniques which are of increasing importance, particularly as they are now incorporated into the registration requirements of some countries and are likely to be included in European Community protocols. The long-term behaviour of pesticides in soils can only be predicted to a limited extent in detailed studies under standardized laboratory conditions. Lysimeter models have been developed, and were presented at Hamburg, in which ^{14}C -labelled pesticides are applied in accordance with agricultural practice. Their fate in the soil-plant system can thus be detected taking into account climatic and biological parameters and those of the soil itself. In these experiments, which permit an analysis of pesticides and metabolites in soils, plants and drainage water over several vegetation periods, realistic data are obtained on the residue situation since the lysimeter results are in good agreement with results from field experiments carried out in parallel.

All the data presented allowed the following statement: pesticides and metabolites generally lose their bioactivity due to ageing in soil and in many cases also their identity, while processes of degradation, fixation/binding and sorption become simultaneously effective. This leads to differently long residence times of carbon from the molecular structure of pesticides, especially as a function of

the soil carbon structures and the bond structures resulting from degradation and fixation processes. During the natural conversion processes taking place in soil, including the compounds from soil carbon fractions such as fulvic acids, humic acids and humin, non-extractable, bound residues (pesticides as well as metabolites) are also released proportionally and partially undergo further degradation. This explains the occurrence of traces of pesticides and metabolites in the subsoil region and groundwater.

On the basis of results from lysimeter experiments, complementary and specifically designed standardized laboratory experiments make an essential contribution towards clarifying individual processes such as adsorption, degradation/mineralization, bioavailability and translocation, thus permitting an interpretation of the lysimeter results and providing indications of key processes in the soil so that important impulses can be obtained for the appropriate practical application of pesticides.

Persistence, transport, transformation and effects in aquatic environments

Agrochemicals are introduced into aquatic environments through direct application or through indirect pathways such as runoff, soil drainage water, partitioning into condensed phase in the troposphere, and atmospheric deposition into freshwater and marine systems. Sunlight-induced direct and indirect photoreactions are an important sink for agrochemicals in such environments.

Both laboratory and field studies have been conducted to develop and test concepts and mathematical relationships that describe environmental photoreactions. These efforts achieved early success in the case of photoreactions involving the direct absorption of solar radiation by agrochemicals. Direct photoreactions, however, account for only part of these sunlight-induced reactions.



Quantitative prediction of the movement and persistence of pesticides in soil has become a crucial issue for both agriculturalists and environmentalists. (Photo courtesy of Shell Photographic Service.)

Recent studies have shown that other reactions involving photochemically produced reactive chemical transients are also an important fate for many agrochemicals. These include hydroxyl, hydroperoxyl/superoxide, organoperoxyl, carbonate, and dibromide ion radicals as well as singlet molecular oxygen. Hydrogen peroxide, a widely distributed oxidant in the sea, freshwaters, and cloud water which is produced via the intermediacy of superoxide radicals, may be involved in the oxidation of agrochemicals by the Fenton reaction or by peroxidase-catalysed oxidations. The nature and concentrations of these transients, and thus indirect photoreaction rates, strongly depend upon the composition of water, in particular on concentrations of dissolved organic matter, nitrate, nitrite, and trace metals.

Modelling behaviour in the environment and integrated experimental approaches

Quantitative prediction of the movement and persistence of pesticides in soil has become a crucial issue for both agriculturalists and environmentalists. The development of comprehensive simulation models of pesticide fate, useful at the

field scale, has been the focus of a number of recent research efforts. These models are generally based upon knowledge developed for laboratory studies and only within the last several years have been tested with field data. The models consider transport by water, diffusion, sorption, degradation, volatilization and (if enough is known) plant uptake. A wide variety of models now exist, differing in their assumptions, method of solution, and applicability by users other than the developer.

Recent research, in both laboratory and field, including lysimeter studies with ^{14}C -labelled compounds, has shown that there are several additional processes which are currently not well represented in pesticide models. Physical non-equilibrium processes (macropore flow) and chemical non-equilibrium processes (kinetic/equilibrium sorption) can have a substantial impact upon the transport and transformation of pesticides within soil and groundwater. The next generation of pesticide models will need to consider such processes, as well as include better descriptions of the spatial variability that is now recognized as inherent in all field soils.

Fritz Führ

Conferences

Plasma chemistry Bochum, Germany 4–9 August 1991

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Due to the situation in the Middle East, the international and local organising committee of the IUPAC-sponsored 10th International Symposium on Plasma Chemistry (ISPC-10) have decided to relocate ISPC-10 from Jerusalem to Ruhr-Universität Bochum, Germany. The date (4–9 August 1991) and scientific programme remain unchanged.

The symposium will incorporate sessions on recent advances in plasma chemistry on both basic and applied research and technology. The sessions will be grouped into three categories.

1. Thermal plasmas

- Modelling (including plasma generation and thermophysical properties)
- Diagnostics
- Plasma/substrate interactions (electrode, particulate, melt, wall interactions, etc.)
- Materials processing (spraying, film deposition, powder synthesis, powder metallurgy, consolidation, etc.)
- Chemical and metallurgical processing (chemical synthesis, chemical processing, extractive metallurgy, melting, heating, etc.)

2. Cold plasmas

- Plasma generation — modelling and diagnostics
 - Plasmas surface interactions — sputtering, etching and depositions — diagnostics and applications
 - 'Barrier' coatings, thin films
 - Synthesis and polymerizations
 - Inorganic and hard coatings (conductive and semi-conductive)
 - Surface characterizations
- #### 3. Special topics
- Industrial applications of cold plasmas
 - ECR and corona discharges at diagnostics and applications
 - Diamond and diamond-like thin films
 - High T_c superconducting films and characterizations
 - ICP atm. pressure — diagnostics and applications

The conference language will be English. The registration fees for participants are USD 245 before 15 May 1991 and USD 280 after that date.

Information on hotel accommodation, social programme and details of the scientific programme, exhibition, workshop and summer school are given in the second circular.

The contact address is Unikontakt, Ruhr-Universität Bochum, Postfach 102148, Universitätsstrape 150, D-W4630 Bochum 1, Germany. Tel: +49 (234) 700 2250. Fax: +49 (234) 700 2232. Telex: 0825860.

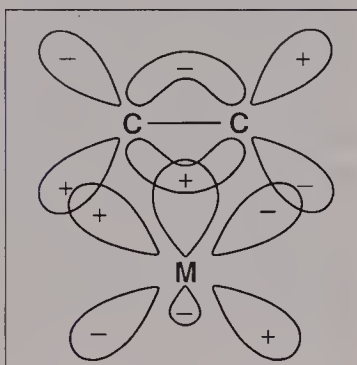
Organometallic chemistry
Utrecht, The Netherlands
25–29 August 1991

IUPAC
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The 6th IUPAC Symposium on Organometallic Chemistry (OMCOS 6) will be held in Utrecht, The Netherlands from 26 to 29 August 1991. Previous meetings have been held in Fort Collins, USA (1981), Dijon, France (1983), Kyoto, Japan (1985), Vancouver, Canada (1987) and Florence, Italy (1989).

OMCOS 6 will open with an informal get-together on Sunday 25 August. Registration and all scientific sessions will take place in the Jaarbeurs Conference Centre adjoining Utrecht Central railway station. The official language of OMCOS 6 will be English.

OMCOS 6



The aims of the symposium are the presentation of recent results, the discussion of trends and the exchange of ideas relating to the use of metals in organic synthesis. The meeting will consist of the following sections:

- Synthesis of molecules of biological interest via organometallics;
- Metallo-enzymes in organic synthesis;
- Synthesis of fine chemicals via organometallics;
- Selective synthetic processes mediated by organometallic compounds; and
- Homogeneous catalysis and structure–reactivity relationships.

The scientific programme will include plenary lectures, invited lectures and oral presentations of short papers. There will also be two separate poster sessions and two mini-symposia to provide ample opportunity for all participants to partake actively in scientific discussions.

The following scientists have accepted invitations to present lectures: Jan-E Bäckvall (Sweden), Stephen L. Buchwald (USA), Stephen G. Davies (UK), Gerhard Erker (Germany), Tamio Hayashi (Japan), Richard M. Kellogg (The Netherlands), Yoshito Kishi (USA), Shun-ichi Murahashi (Japan), Ei-ichi Negishi (USA), Michel Pfeffer (France), Manfred T. Reetz (Germany), and Barry M. Trost (USA).

The city of Utrecht originates from a Roman settlement founded in 48 AD. In the Middle Ages, this developed into a Dutch city that ranked first in size and importance until the sixteenth century.

Today, the city still has many unique churches, houses and canals that date from this period of prosperity. Utrecht, which currently has a population of 230 000, is the fourth largest city in The Netherlands. It boasts one of the biggest shopping centres in Europe (Hoog Catharijne), an ideally situated major conference centre (the Jaarbeurs) and the largest Dutch university with 25 000 students.

A variety of hotels close to the conference site in Utrecht will be available. Utrecht is a readily accessible city, being a focal point in the highway and railway system of The Netherlands. For air travellers, the city is well connected, by road and rail, to the international airport at Amsterdam (Schipol Airport).



Stephen Davies (Oxford, UK) is one of the lecturers at OMCOS 6.

Analytical sciences
Chiba, Japan
25–31 August 1991

IUPAC
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The 1991 International Congress on Analytical Sciences (ICAS 91) is organized by the Japan Society for Analytical Chemistry (JSAC) and the Science Council of Japan. The conference venue is Makuhari-Messe which is a new and large complex of exhibition and international conference facilities. It is located in the newly developed Tokyo Bay water front area and is also near Tokyo Disney Land.

The congress aims to provide a forum for discussion of recent research and future trends in the various fields of analytical science. The title 'analytical sciences' has been used in order to facilitate interdisciplinary and multidisciplinary discussion, though traditional analytical chemistry will remain the core of ICAS 91.

The scientific programme will consist of eight sections containing seven main subjects and organized symposia. The congress will commence with a plenary session with the following tentative lecture titles.

- Scanning tunnelling microscopy (H. Rohrer — Zurich, Switzerland)
- The analysis of molecular structure and molecular dynamics by two- and three-dimensional NMR (R. Ernst — ETH, Switzerland)
- Monitoring of the global environment — participation of Japan and other Asian countries (K. Fuwa — Tokyo, Japan)
- Monolayer surface structure analysis (G. A. Somorjai — California, USA)
- In pursuit of accuracy: standard materials, standard data and assumption validity (L. A. Currie — USA)

The following are the titles of the sections corresponding to the main subjects and keynote lecturers.

1. Separation sciences
2. Chemical speciation and characterization
3. New principles, reactions and techniques
4. Chemometrics and robotics
5. Biochemical/biomedical
6. Environmental
7. High-tech materials
8. Symposia

Six symposia are tentatively planned for Section 8: (1) Asianalysis; (2) New frontiers of electroanalytical chemistry; (3) Bio- and chemi-luminescence: applications to analytical chemistry; (4) Recent advances in chromatography and electrophoresis; (5) Laser analytical spectroscopy; and (6) Topics in chemometrics.

All lectures, talks and poster presentations will be in English — the official language of the conference. No simultaneous translation will be available.

The registration fees before/after 31st May are, for JSAC, supporting societies and IUPAC affiliate

members, JPY 40 000/60 000. Accommodation will be available in hotels located in Makuhari, Chiba and Tokyo with room rates ranging from JPY 7 000 (single with bath) to JPY 22 000 (twin with bath). Excursions to several historic places including the Imperial Palace are planned.

Chemical education York, UK 25–30 August 1991

IUPAC
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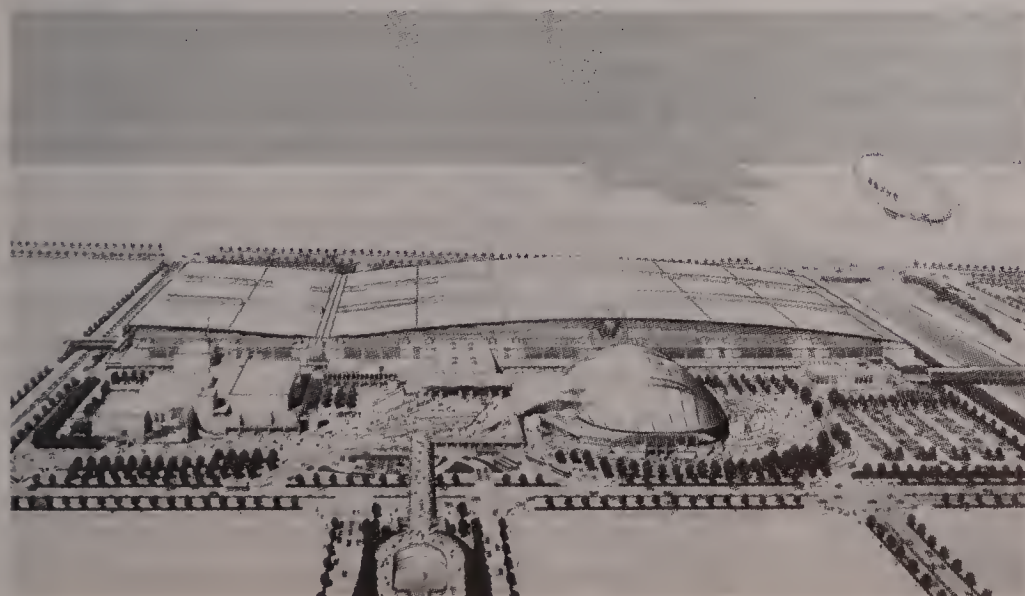
The 11th International Conference on Chemical Education (11th ICCE) will be held at the University of York, York, UK. The central theme of the conference will be 'Bringing chemistry to life'. The conference language will be English.

The conference will focus on:

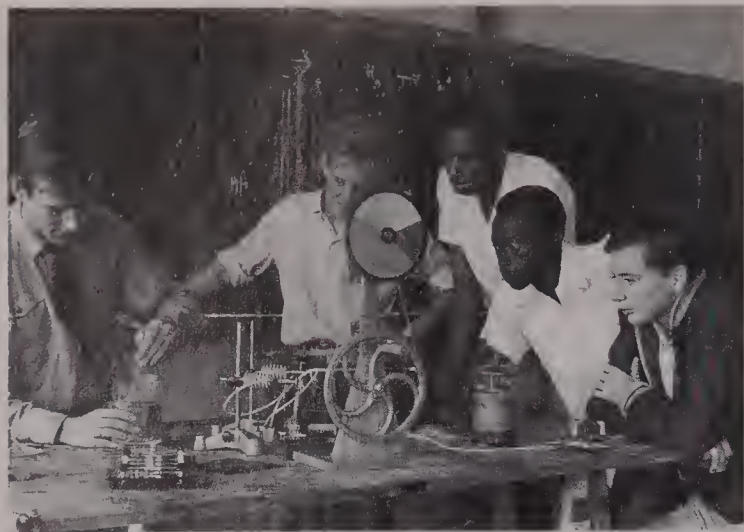
- making chemistry accessible to all students;
- new curricula at primary, secondary and post-secondary levels;
- new teaching strategies at all levels;
- teaching and learning at a distance;
- new frontiers of chemistry and their impact on teaching; and
- research in chemical education.

The opening lecture on 'Bringing inorganic chemistry to life' will be given by Prof. R. J. P. Williams (University of Oxford, UK). Other speakers include: Mrs Susan Adamson (Poynton County High School, UK), Prof. Daniele Cros (University of Montpellier, France), Prof. A. Ghorbel (University of Tunis, Tunisia), Prof. Henry Heikkinen (University of Northern Colorado, USA), Prof. Alex Johnstone (University of Glasgow, Scotland) and Dr Wobbe de Vos (University of Utrecht, The Netherlands).

Five or six 2-hour symposia will run concurrently each morning from Monday to Thursday. They will provide opportunities for the exchange of information, ideas and opinions. Each symposium has a title, in the form of a question, concerning an important current issue in chemical education, for



ICAS 91 will be held at Makuhari-Messe, Chiba, Japan.



'Bringing chemistry to life' is the theme of the 11th International Conference on Chemical Education to be held in York, UK in August. (United Nations photo.)

example, 'How should international agencies and science teacher associations support chemistry teaching?' and 'How can low-cost equipment be developed and used?'

During each afternoon, several 2-hour workshops will run concurrently. Each workshop will explore a project or a theme, for example, 'The IUPAC-UNESCO International Curriculum Development Project' and 'ICSU Education in Global Change Project'. Participants will have the opportunity of gaining 'hands-on' experience of each project, for example, looking at printed materials, attempting some of the activities suggested by the project and so on.

Although the main thrust of the conference deals with chemical education, there will also be an opportunity to hear from leaders in their fields about frontier topics in chemistry which are particularly relevant to 'Bringing chemistry to life'.

- Chemistry in the atmosphere (Prof. Michael Pilling — Leeds, UK)
- Chemistry and crop protection (Prof. K. Mengel — Schabenheim, Germany)
- Liquid crystals (Prof. George Gray — Paole, UK)
- Proteins in the cell (Dr Jean Thomas — Cambridge, UK)
- New petroleum chemistry (Dr Christine Baillon-Moussel — Lavera, France)

The conference also includes poster papers and displays. A wide diversity of lectures will provide the focus of after-dinner conversation and entertainment on two evenings and an extensive social programme has been arranged including visits to York and Yorkshire.

The registration fees before/after 15 May 1991 are GBP 145/165 for full participants (10% reduction available for affiliates) and GBP 65/75 for accompanying persons. Accommodation is available on campus in the residential wings of two colleges. The full accommodation package costs GBP 150.

The organizers hope the sun will shine on their activities but English weather, even in summer, is difficult to predict. August usually brings warm summer days, the occasional passing shower and cool evenings. Average day temperatures are around 21°C/70°F.

The City of York, founded in AD 71, has, at various stages in its history, been a Roman regional capital, the capital of the Anglian kingdom of Northumbria, the most important Viking trading establishment in Britain and the centre from which the North of England was governed until 1650. Although the Cathedral, known as the Minster, is its most famous building, there are many other historical buildings, which remain intact; thanks to careful planning, a successful blend of old and new has been achieved.

Applications of the Mössbauer effect

Nanjing, China

16–20 September 1991

The next International Conference on the Applications of the Mössbauer Effect (ICAME 91) will be held in Nanjing, China from 16–20 September 1991. The conference language will be English.

The organizers are the Chinese Nuclear Physics Society, Nanjing University and the Jiangsu International Conference Center for Science and Technology (JICCST). The conference is sponsored by IUPAC, the International Union of Pure and Applied Physics (IUPAP), the Chinese Nuclear Society and the National Natural Science Foundation of China.

The conference will consist of invited papers, oral presentations and poster sessions. The following is a provisional list of invited papers.

- Hyperfine field calculations for various alloy systems (H. Akai, Japan)
- High- T_c superconductivity (Boolchand, USA)
- Rare earth permanent magnets (J. M. D. Coey, Ireland)
- Spin coupling in iron-containing proteins and model complexes (X. Q. Ding, Germany/China)
- Ordered and disordered states in magnetically diluted insulating systems (J. L. Dormann, France)
- Applications of Mössbauer spectroscopy in catalysis (J. Dumesic, USA)
- Mössbauer spectroscopy on the reaction centres of photo-synthetic bacteria (E. F. Frolov, USSR)
- Perspectives in physical metallurgy (U. Gonser, Germany)
- Direct excitation of Mössbauer nuclei by synchrotron radiation (J. B. Hastings, USA)
- Ion implantation (G. Langouche, Belgium)

Ultrafine amorphous alloy particles (S. Linder-oth, Denmark)

Cryogenic detector developments (R. L. Mössbauer, Germany)

Ion-beam Mössbauer spectroscopy with heavy-ion accelerators (R. Sielemann)

New one-dimensional solids (M. F. Thomas, UK)

Studies of archaeological problems by Mössbauer spectroscopy (Y. Zheng, China)

The following are the main fields of interest to be covered by ICAME 91.

1. Chemical structure and bonding
2. Magnetism and magnetic materials
3. Metals and alloys
4. Non-crystalline materials
5. Catalysis, corrosion and surface phenomena
6. Radiation damage and implantation
7. Mineralogy, geology and archaeology
8. Lattice dynamics and phase transitions
9. Relaxation effects and diffusion
10. Superconductors
11. After-effects of nuclear transformation
12. Biological systems
13. Coherent phenomena
14. Dilute and low-dimensional systems. Clusters
15. Industrial applications
16. New developments in theory and experiments
17. Mössbauer spectroscopy and other techniques



Nanjing University: venue of ICAME 91.

The registration fee for ICAME 91 will be USD 190 for scientists if paid before 15 July 1991. IUPAC affiliates are entitled to a 10% reduction. The fee after this date is USD220. The fee includes conference attendance, book of abstracts, refreshments in the conference breaks and welcoming buffet, get-together party and Wednesday afternoon excursion. The proceedings, sightseeing tour, cultural events and conference banquet are not included.

The proceedings will be published as special volumes of the international journal *Hyperfine Interactions*. This is scheduled for publication in May 1992.

Nanjing can easily be reached by air, train or car. It is only 4 hours travelling time by express train from Shanghai, 90 minutes by air from Beijing or 2 hours from Hong Kong. Nanjing's climate is subtropical. Autumn is the best season in the year. The mean temperature in the second half of September in this area is 26–28°C.

Accommodation will be available in the Overseas Chinese Mansion located in the centre of Nanjing city and near Nanjing University. Regular bus and taxi services are available.

Self-propagating high-temperature synthesis *Alma-Ata, USSR* 23–28 September 1991

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The 1st International Symposium on Self-Propagating High Temperature Synthesis (SHS-1) will be held in the USSR Academy of Sciences and Interdisciplinary Science & Technology Complex 'Termosintez' under the aegis of IUPAC and the Combustion Institute.

SHS is a unique process for the production of advanced materials based on solid-state combustion using internally generated chemical energy. Synthesizing capabilities of SHS are enormous and up to now more than 500 inorganic compounds and stable phases have been produced by the SHS method. Numerous varieties of SHS technology have been developed which may be used for commercial production of refractory and hard material powders, deposition of protective coatings of different thickness and applications, and manufacturing fully dense and complex shape parts from hard refractory ceramic and gradient materials. SHS technology for the production of high temperature superconductors is, currently, beyond comparison in terms of efficiency and quality of materials produced.

SHS research and development first began in the USSR more than 20 years ago. In the 1980s, research in this field was initiated in other countries — especially in Japan and USA. Currently, such activities are so widespread that regular international meetings have become desirable.

SHS-1 is the continuation of separate international contacts first formed in 1988. The symposium will consist of sessions on seven topics. No concurrent sessions are planned. The seven topics are:

1. Regularities and mechanism of combustion in SHS systems;
2. Thermodynamics and kinetics of SHS reactions;
3. Theory and mathematical modelling;
4. Structural macrokinetics and SHS processes;
5. Chemistry of SHS combustion systems. Chemical syntheses;



The 1st International Symposium on Self-Propagating High-Temperature Synthesis (SHS-1) will consist of sessions on seven topics including advanced SHS materials.

6. Advanced SHS materials. Properties and applications of SHS products; and
7. SHS technology.

Each session will comprise one invited mini-review, six invited oral presentations, and 20–25 posters on corresponding topics.

At the opening ceremony, Alexander G. Merzhanov will present a plenary lecture on 'World-wide development of SHS'. On the final day, John W. Kiser will present a plenary lecture on 'Commercialization of SHS R&D'.

Mini-reviews of the following topics will also be presented.

- Initiation of SHS processes (V. V. Barzykin, USSR)
- Kinetics of high-temperature reactions in heterogeneous media: SHS-related aspects (A. S. Shteinberg, USSR)
- Non-linear phenomena in SHS-processes: experiment, theory and modelling (B. V. Novzhilov, USSR)
- Structural macrokinetics of SHS processes (A. G. Merzhanov and A. S. Rogachev, USSR)
- Chemical classes of SHS processes and products (I. P. Borovinskaya, USSR)
- Physical aspects of SHS-produced materials studies (R. M. Spriggs, USA)
- Varieties of SHS technology (V. I. Yukhid, USSR)

The symposium sessions will be held in the House of Scientists of the Kazah Academy of Sciences in a well-equipped lecture theatre. The working languages of the symposium will be Russian and English. Simultaneous translation of talks and discussions will be provided during session meetings.

A special reading room will operate during the symposium which will provide an opportunity for participants to get acquainted with the complex text or extended abstract of any accepted paper. A topical exhibition of books, reviews as well as

papers in editions not-easily-available is also planned.

The plenary lectures and mini-reviews will be published in *PAC*. A two-volume proceedings of the symposium will be published, in English, within 1 year.

The registration fee, if paid before 1 July 1991, will be USD395 for symposium participants and USD195 for students and accompanying persons. After 1 July 1991 the fees will be increased by USD100 and USD50, respectively. The fees cover the cost of the symposium kit (which includes a set of information documents and the abstracts) plus a welcome reception, get-together party, one part of the culture programme, mountain trip to Medeo with barbecue and the farewell reception.

Two downtown hotels are available for accommodation. A block of rooms at USD90 to USD120 per night (single or double) has been reserved on behalf of the symposium at 3-star hotels. These are 5–10 minutes walk from the House of Scientists.

Alma-Ata, Kazakhstan's capital, is a city with about one million population. It is a large cultural, scientific and industrial centre in the southern part of the country. Aeroflot operates several daily domestic services between Moscow and Alma-Ata. The flight time is four hours.

Towards the end of September in Alma-Ata, the average maximum daytime temperature is 23°C and the average minimum night-time temperature is 12°C. There is a 10% chance of rain.

A special cultural programme has been developed for participants and accompanying persons. This includes bus tours around the city and neighbourhood, visits to an art gallery, museums, theatres and exhibitions. Participants from abroad may use the services provided by the Soviet travel agency Intourist and its agencies in different countries to make reservations for additional post-symposium tours to Leningrad, to the ancient Middle Asia towns of Bukhara and Samarkand, and along the Golden Ring of Russia.

Entry visas will be granted to all *bona fide* scientists and engineers provided application is made not less than 3 months in advance.

Foreign participants will be met in Moscow International Airport Sheremetyevo-2 by the representatives of the Soviet Organizing Committee (SOCOM) who will give all the necessary help to foreign participants during their stay of up to 2 days in Moscow prior to the symposium, as well as during their departure to Alma-Ata from Moscow.

A shuttle bus service will be provided for the symposium attendees between Alma-Ata domestic airport and the House of Scientists and hotels.

Upon their return from Alma-Ata to Moscow, symposium participants will also be met by SOCOM representatives to provide them with transportation and hotel accommodation at their request.

Recycling of polymers Marbella, Spain 18–12 September 1991

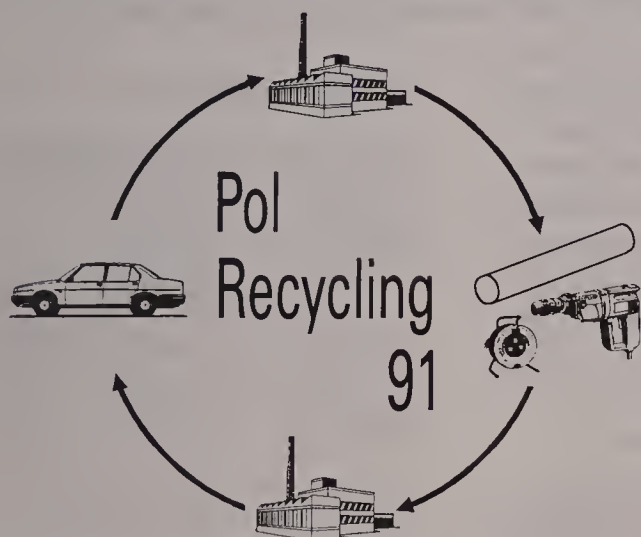
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Recycling of polymers is an urgent economic problem. This IUPAC International Symposium on Recycling of Polymers — Science and Technology will concentrate on materials and technical problems. The symposium will be held at Hotel Don Carlos, Marbella, Spain from 18 to 20 September 1991.

The scientific programme will be devoted to science and technology of polymer recycling covering the following topics:

- Advances in existing technologies;
- Modification by pyrolysis, solvolysis and hydrogenation;
- Simple separation methods for polymer mixtures; and
- Increase of quality in recycling of polymers.

The keynote lectures are: (1) Recycling of alumina (T. Schopp, Aluswiss, Switzerland); (2) Concepts of polymer recycling (F. Mader, A.M.P.E., Belgium); and (3) Present situation of waste plastics recycling technologies and their prospects in Japan (R. Ijima, Plastic Waste Managements Institute, Japan).



The congress language will be English. A translation service will not be available.

The registration fees are (before/after) 15 May 1991: congress participants DEM800/1000; IUPAC affiliates DEM720; accompanying persons DEM3000. Accommodation will be available in local hotels at rates ranging from ESP8000 to ESP18 000 per person per night including breakfast. Lunch and coffee during the breaks are included in the registration fee. Dinners and the Conference Banquet are not included. A welcome reception will be held on Tuesday, 17 September in Hotel Don Carlos.

The climate in September is usually mild and dry. Please do not forget your swimming costume. Formal dress is not required. Three full-day and one half-day excursions are planned.

Organic chemistry

The 7th European Symposium on Organic Chemistry (ESOC 7) will be held in Namur, Belgium, 15–19 July 1991. The topics include synthetic organic chemistry, physical and bio-organic chemistry.

For further details please contact: Prof. A. Krief, Department of Organic Chemistry, Facultes Universitaires Notre Dame de la Paix, 61, rue de Bruxelles — B-5000 Namur, Belgium. Tel: +32 (81) 72 45 39. Telex: 59222 facnam, Fax: +32 (81) 72 45 36.

Asian Chemical Congress

The 4th Asian Chemical Congress (4ACC) will be held in Beijing, China, from 26 to 30 August 1991 under the auspices of the Federation of Asian Chemical Societies.

The theme of the congress will be the role of chemistry in raising the health and living standards of mankind. The scientific programme will consist of plenary lectures and invited and contributed papers divided into the following sections.

1. Organic chemistry of natural products
2. Analytical chemistry and analytical instrumentation
3. Environmental chemistry
4. Agrochemistry
5. Coordination chemistry and its applications to medicine, agriculture, etc.
6. Polymer science
7. Photochemistry
8. Chemical education
9. Computers in the practice of chemistry
10. Catalysts

The official language will be English.

All correspondence should be addressed to: Prof. Dehe Zhang, Secretary-General of 4ACC, c/o Chinese Chemical Society, PO Box 2709, Beijing 100080, China.

European Congress on Mixing

The 7th European Conference on Mixing will take place in Brugge, Belgium, 18–20 September 1991. The meeting is being held under the auspices of the European Federation of Chemical Engineering — an Associated Organization of IUPAC. Conference topics include: mixing of homogeneous Newtonian or non-Newtonian fluids; mixing technology of heterogeneous systems; mixing and chemical reactions; and mixing in the process industries (e.g. food, pharmaceutical, petrochemical, and polymer industries).

For further information contact: 7th European Conference on Mixing, c/o TI-K.VIV, Attn Ms Rita Peys, Desquinlei 214, B-2018 Antwerpen, Belgium. Tel: +32 (3) 216 09 96. Fax: +32 (3) 216 06 89.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1991

Vapor-liquid equilibrium

13–17 May. 6th International Workshop on Vapor-Liquid Equilibrium in 1-Alkanol + n-Alkane Mixtures. Liblice, Czechoslovakia.

(Prof. R. Holub, Vysoka Skola Chemicko-Technologicka, Katedra Fyzikalni Chemie, Suchbatarova 5, 166-28 Prague, Czechoslovakia.)

Spectroscopy

9–14 June. 17th Colloquium Spectroscopicum Internationale. Bergen, Norway.

(17th Colloquium Spectroscopicum Internationale, HSD Congress — Conference, PO Box 1721 Nordenes, N — 5024 Bergen, Norway.)

Solution properties of modified polymers

10–14 June. 8th Bratislava International Conference on Solution Properties of Modified



Bergen will host the 17th Colloquium Spectroscopicum Internationale.

Polymers. Tatranska Lomnica, High Tatras, Czechoslovakia. (Dr Dieter Lath, Polymer Institute, Slovak Academy of Sciences, 842 36 Bratislava, Czechoslovakia. Tel +42 (7) 3782973. Fax. +42 (7) 375 923. Telex 933 55 TKSAV C.)

Calorimetry and chemical thermodynamics

23–28 June. International Symposium on Calorimetry and Chemical Thermodynamics. Moscow, USSR.

(Dr. M. V. Korobov, Chemistry Department, Moscow State University. 119899, GSP, Moscow, USSR.)

Surface and colloid science

7–12 July. 7th International Conference on Surface and Colloid Science. Compiègne, France.

(Secretariat of the 7th ICSCS, c/o Wagons-Lits Tourisme, BP 244, F-92307 Levallois-Perrett Cédex, France.)

Solution chemistry

14–19 July. 22nd International Conference on Solution Chemistry. Linz, Austria.

(XXII ICSC, Institut für Chemische Technologie, Anorganische Stoffe, Johannes Kepler Universität, A-4040 Linz, Austria.)

Rheology of polymer melts

15–18 July. 14th Discussion Conference on Macromolecules Rheology of Polymer Melts. Prague Czechoslovakia.

(14th Discussion Conference, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia. Tel. +42 (2) 360341. Fax +42 (2) 367981. Telex 122019 IMCP C.)

Plasma chemistry

4–9 August. 10th International Symposium on Plasma Chemistry. Bochum, Germany.

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably **2 YEARS** and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *CI*, Vol. 11, No. 1, pp. 4–5, 1989.

(Unikontakt, Ruhr-Universität Bochum, Postfach 102148, Universitätstrasse 150, D-W4630 Bochum 1, Germany. Tel. +49 234 700 2250. Fax. +49 234 700 2232. Telex 0825860.)

IUPAC General Assembly

7–15 August. 36th IUPAC General Assembly. Hamburg, Germany.

(The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

IUPAC Congress

17–22 August. 33rd IUPAC Congress. Budapest, Hungary.

(33rd IUPAC Congress, Prof. E. Pungor, c/o Hungarian Academy of Science, H-1111 Budapest, Gellért tér 4, Hungary. Tel. +36 (1) 664 705. Fax. +36 (1) 851 477 Telex 225931 MUEGY H.)

Organometallic chemistry

25–29 August. 6th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS). Utrecht, The Netherlands.

(Symposium Secretariat OMCOS 6, Congress Bureau, Royal Netherlands Industries Fair, PO Box 8500, 3505 RM UTRECHT, The Netherlands.)

Chemical education

25–30 August. 11th International Conference on Chemical Education. York, UK.

(Dr J. F. Gibson, The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN. Tel. +44 (71) 437 8656. Fax. +44 (71) 437 8883.)

Analytical sciences

25–31 August. International Congress on Analytical Sciences. Chiba, Japan.

(ICAS '91 Secretariat, The Japan Society for Analytical Chemistry, 1-26-2, Nishigo-

tanda, Shinagawa, Tokyo 141, Japan. Tel. +81 (3) 34903351 Fax. +81 (3) 34903572.)

Cationic polymerization

26–29 August. 10th International Symposium on Cationic Polymerization and Related Ionic Processes. Balatonfüred, Hungary.

(Prof. T. Kelen, Institute of Applied Chemistry, Kossuth Lajos University, H-4010 Debrecen, Hungary.)

Positron annihilation

26–31 August. 9th International Conference on Positron Annihilation. Szombathely, Hungary.

(Prof. Z. Kajcsos, Central Research Institute for Physics, PO Box 398, H-1536 Budapest 114, Hungary.)

Spectroscopy of biological molecules

1–6 September. 4th European Conference on the Spectroscopy of Biological Molecules. York, UK.

(Prof. R. E. Hester, Department of Chemistry, University of York, Heslington, York YO1 5DD, UK. Tel. +44 (0742) 768555 Fax. +44 (0742) 739826 Telex 547216 UG SHEF G.)

Mössbauer effect

16–20 September. International Conference on the Applications of the Mössbauer Effect. Nanjing, China.

(Prof. Y. F. Hsia, Chairman, ICAME '91, Department of Physics, Nanjing University, Nanjing 210008, China. Tel. +86 (025) 647361 Fax. +86 (025) 403435 Telex 34151 PRCNU CN.)

Recycling of polymers

18–20 September. International Symposium on Recycling of Polymers: Science & Technology. Marbella, Spain.

(Prof. W. Heitz, Philipps-Universität Marburg, Physikalische Chemie, Hans-Meerwein-Strasse, D(W)-3550 Marburg, Germany. Tel. +49 (64421) 285776 Fax. +49 (6421) 285785 Telex 482373 UMR D.)

Self-propagating high-temperature synthesis

23–28 September. 1st International Symposium on Self-Propagating High-Temperature Synthesis (SHS). Alma-Ata, USSR.

(Dr O. E. Kashiireninov, Institute of Structural Macrokinetics, 142432 Chernoglovka, Moscow Region, USSR.)

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than 3 months in advance. If a visa is not granted 1 month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

In the case of the 32nd IUPAC Congress (Stockholm, Sweden: 2–7 August 1989), it was observed that the time for treating visa applications in Sweden may be as long as 5–6 weeks. To this must be added the time for handling the applications at the Swedish Embassy in the various countries of the intending participants. This confirms the need for applications to be made not less than 3 months in advance.

Electron spin echo spectroscopy

25–28 September. International Workshop on Electron Echo Spectroscopy. Novosibirsk, USSR.

(Prof. Yu. D. Tsvetkov, Institute of Chemical Kinetics & Combustion, 630090 Novosibirsk, USSR. Tel. +7 (3832) 354832. Fax. +7 (3832) 352350. Telex 133148 KING SU.)

Macromolecule–metal complexes

30 September–5 October. 4th International Symposium on Macromolecule–Metal Complexes. Siena, Italy.

(Prof. R. Barbucci, Dipartimento di Chimica, Università de Siena, Piano dei Mantellini 44, 53110 Siena, Italy.)

Polynuclear aromatic hydrocarbons

1–4 October. 13th International Symposium on Polynuclear Hydrocarbons. Palais des Congrès, Bordeaux, France.

(Dr Ph. Garrigues, UA 348 CNRS, University of Bordeaux 1, F-33405 Talence Cédex, France.)

Olefin and vinyl polymerization

14–18 October. International Symposium on Olefin and Vinyl Polymerization and Functionalization — Reaction, Mechanism and Industrial Application. Hangzhou, China.

(Prof. Xin-De Feng, Chemistry Department, Peking University, Beijing 100871, PR China.)

New polymers

30 November–1 December. International Symposium on New Polymers. Kyoto, Japan.

(Prof. Toshinobu Higashiura, Department of Polymer Chemistry, Kyoto University, Yoshida, Sakyo-ku, Kyoto 606, Japan.)

CHEMRAWN VII

2–6 December. World Conference on Chemistry of the Atmosphere: Its Impact on Global Change. Baltimore, Maryland, USA.

(CHEMRAWN VII Secretariat, c/o American Chemical Society, 1155, 16th Street, NW, Room 205, Washington, DC 20036-4899, USA.)

1992

Enzymes in organic synthesis

6–9 January. International Symposium on Enzymes in Organic Synthesis. New Delhi, India.

(Dr V. S. Parmar, Department of Chemistry, University of Delhi, Delhi-110007, India.)

Organic synthesis

5–9 July. 9th International Conference on Organic Synthesis. Montréal, Québec, Canada.

(Prof. Jean-Claude Richer, Département de Chimie, Université de Montréal, CP 6128 succursale A, Montréal, Québec H3C 3J7, Canada.)

Ring opening polymerization

7–12 July. International Symposium on Ring Opening Polymerization. Warsaw, Poland.

(Prof. Zbigniew J. Jedlinski, Institute of Polymer Chemistry, Polish Academy of Sciences, 34 M. Curie-Sklodowska St, 41-300 Zabrze, Poland.)

Risk management of chemicals

13–16 July. International Symposium on Risk Management of Chemicals. Can Chemicals Be Used Safely? Guildford, UK.

(Dr J. F. Gibson, Secretary (Scientific), The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

Macromolecules

13–18 July. 34th International Symposium on Macromolecules. Prague, Czechoslovakia.

(IUPAC Macro 92 Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského nám. 18882/2, 16206 Prague 6, Czechoslovakia. Tel. +42 (2) 360317. Telex 122019 IMCP C.)

Coordination chemistry

19–24 July. 29th International Conference on Coordination Chemistry. Lausanne, Switzerland.

(Prof. A. E. Merbach, Institut de Chimie Minérale et Analytique, Université de Lausanne, Place du Château 3, CH-1055 Lausanne, Switzerland.)

Exploration, mining and processing of materials

2–7 August. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Randburg, Transvaal, South Africa.

(The Symposium Secretariat, Mintex, Private Bag X3015, Randburg, 2125 South Africa. Tel. +27 (11) 7933511 Fax. +27 (11) 7932413 Telex 424867 SA.)

1993

Boron chemistry

13–17 July. 8th International Meeting on Boron Chemistry (IMBERON VIII), Tennessee, USA.

(Prof. G. W. Kabalka, Director of Basic Research, the University of Tennessee, Biomedical Imaging Center, 575 Buehler Hall, Knoxville, Tennessee 37996-1600, USA.)

International Union of Pure and Applied Chemistry (IUPAC)



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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 43 countries, each represented by a national organization, such as an academy of science or research council.

National Adhering Organizations

Academy of Scientific Research and Technology
(**Arab Republic of Egypt**)

Asociación Química Argentina (**Argentina**)

Australian Academy of Science (**Australia**)

Österreichische Akademie der Wissenschaften (**Austria**)

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(**Czechoslovakia**)

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(**Netherlands**)

Royal Society of New Zealand (**New Zealand**)

Chemical Society of Nigeria (**Nigeria**)

Norsk Kjemisk Selskap (**Norway**)

Sociedad Química del Perú (**Peru**)

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Schweizerisches Komitee für Chemie (**Switzerland**)

Türkiye Kimya Dernegi (**Turkey**)

Academy of Sciences of USSR (**USSR**)

Royal Society (**United Kingdom**)

National Research Council, National Academy of
Sciences (**USA**)

Unija Hemijskih Drustava Jugoslavije (**Yugoslavia**)

Chemistry International



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Chemistry International

The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



1991, Vol. 13. No. 4 (July)

Blackwell Scientific Publications

Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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SECRETARIAL ASSISTANT: Mary Patterson

PRODUCTION EDITOR: Martin Clutterbuck

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Six issues of *Chemistry International* will be published in 1991. The 1991 subscription rate including postage is GBP 37.50 (UK), GBP 37.50 (overseas except North America) USD 58.00 (US and Canada). The individual subscription rate is USD 33.00. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Blackwell Scientific Publications Ltd, PO Box 88, Oxford, UK.

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Despatch. The news magazine is despatched within Europe by surface mail, to other continents by various forms of air speeded delivery: to the US* by air freight for forwarding by second class post, to India by air freight for guaranteed local delivery, and to all other countries by Accelerated Surface Post.

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Front cover: The 36th IUPAC General Assembly will be held in Hamburg, Germany.

IUPAC General Assembly



IUPAC general assemblies are held in odd-numbered years. This year, the 36th General Assembly will take place in Hamburg, Germany, during August.

IUPAC's general assemblies are held every other year. They consist of a set of meetings of IUPAC's Council, Bureau, commissions and committees. At any one time over 30 meetings may be taking place simultaneously. Only members of IUPAC bodies (such as commissions and committees), national representatives and invited observers may attend these meetings.

Although some meetings will be held in Hamburg during the period Monday 29 July to Tuesday 6 August, prior to the general assembly, the main work of the commissions and committees will commence on Wednesday 7 August and continue right through to Monday 12 August. The Bureau will then meet on 12 and 13 August and again on Thursday 15 August. The climax is reached on the 14th and 15th of the month when the Council meets. The Executive Committee also meets on 15 August.

The Bureau acts for the Union during intervals between meetings of the Council. The Council is composed of delegates of the 43 member countries. The Bureau and all the committees, divisions and commissions of IUPAC are responsible to Council.

Gesellschaft Deutscher Chemiker hosts the general assembly

The 36th IUPAC General Assembly will be hosted by Gesellschaft Deutscher Chemiker (German Chemical Society) on behalf of the Deutscher Zentrallausschuß für Chemie (German Central Committee for Chemistry), and the Department of Chemistry of the University of Hamburg.

The general assembly will take place in the buildings of the Chemistry Department of the University of Hamburg and in the 'Staatliche Gewerbeschule', Bundesstraße 58 (a nearby school). The university is located about 3 km from the centre of Hamburg. Accommodation for general assembly participants is available at various hotels near the university or in the centre of Hamburg.

Hamburg

Hamburg is located on the Elbe River about 110 km from the point at which the Elbe empties into the North Sea. It has its own international airport (Hamburg-Fuhlsbüttel) and can therefore be reached directly from many other countries. Alternatively, it can be reached via Frankfurt International Airport. Hamburg has regular intercity

IUPAC General Assemblies

36th	Hamburg (Germany)	1991
35th	Lund (Sweden)	1989
34th	Boston (USA)	1987
33rd	Lyon (France)	1986
32nd	Lyngby (Denmark)	1983
31st	Leuven (Belgium)	1981
30th	Davos (Switzerland)	1979
29th	Warsaw (Poland)	1977
28th	Madrid (Spain)	1975
27th	Munich (FRG)	1973
26th	Washington, DC (USA)	1971
25th	Cortina d'Ampezzo (Italy)	1969
24th	Prague (Czechoslovakia)	1967
23rd	Paris (France)	1965
22nd	London (UK)	1963
21st	Montreal (Canada)	1961
20th	Munich (FRG)	1959
19th	Paris (France)	1957
18th	Zürich (Switzerland)	1955
17th	Stockholm (Sweden)	1953
16th	New York City/ Washington DC (USA)	1951
15th	Amsterdam (Netherlands)	1949
14th	London (UK)	1947
13th	Rome (Italy)	1938
12th	Lucerne/Zürich (Switzerland)	1936
11th	Madrid (Spain)	1934
10th	Liège (Belgium)	1930
9th	The Hague (Netherlands)	1928
8th	Warsaw (Poland)	1927
7th	Washington, DC (USA)	1926
6th	Bucharest (Romania)	1925
5th	Copenhagen (Denmark)	1924
4th	Cambridge (UK)	1923
3rd	Lyon (France)	1922
2nd	Brussels (Belgium)	1921
1st	Rome (Italy)	1920

train connections to Frankfurt and all other big cities in Germany. The railroad station Bahnhof Dammtor is located close to the university.

Hamburg covers an area of over 700 km² and has a population in the region of 2 million. Because of Hamburg's low elevation and proximity to the sea, its weather is humid and mild — and quite changeable. The temperature in August normally ranges from 15 to 20°C.

Hamburg is laid out in the form of a semicircle based on the Elbe's eastern bank. This is bisected by the Alster River, a tributary of the Elbe, which is dammed to form a lake. The newer part of Hamburg lies to the west of the lake and the old part of the city, crossed by many canals, lies to the east. In 1842, much of the old city was destroyed by fire. After destruction by Allied bombing in World War II, the city was largely rebuilt.

The port, which is one of the largest and busiest in Europe, is Hamburg's main economic asset. Shipping is the basis of many of the city's industries. Raw materials imported from abroad, such as oil, iron ore, copper, wheat, wool, cotton, and hides are all processed in Hamburg.

Educational and cultural facilities include the University of Hamburg, founded in 1919, several music conservatories, symphony orchestra, museums and theatres. Hamburg originated early in the ninth century AD, when Charlemagne built the Hammaburg fortress at the confluence of the Elbe and Alster rivers. During the thirteenth century Hamburg became a member of the Hanseatic league and in 1815 it joined the German Confederation. The city was incorporated in to the German Empire in 1871.

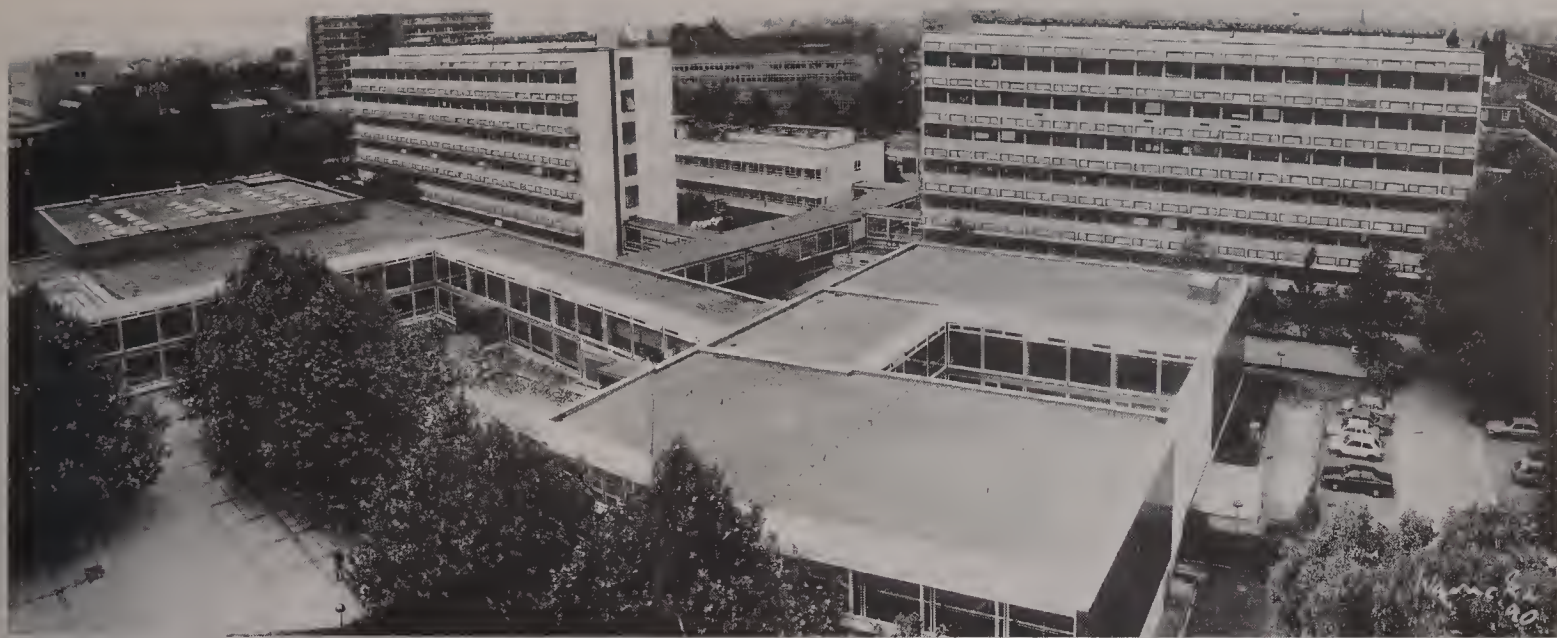
Hamburg and hamburger: dictionary definitions

Hamburg *ham'bûrg*, *n.* a black variety of grape: a small blue-legged domestic fowl. — *n.* **ham'burg(h)er** Hamburg steak, finely chopped meat: (a bread roll containing) this meat shaped into a round flat cake and fried: a large sausage. [*Hamburg* in Germany.]

from *Chambers Concise 20th Century Dictionary*, 1985



Clockwise from top: downtown Hamburg and the Alster Lake. Hamburg's harbour framed by St Michaelis Church and the television tower. One of the many canals that traverse Hamburg. Hamburg Townhall.



Department of Chemistry, University of Hamburg.

Council agenda



The following is the agenda for the 36th IUPAC Council Meeting to be held in Hamburg, Germany, on 14–15 August 1991

1. Introductory remarks and finalization of agenda
2. Approval of minutes of 35th Council Meeting and matters arising
3. Ratification of decisions taken by Bureau and Executive Committee since 35th General Assembly
4. Announcement of nominations for officers and Bureau members
5. Announcement of time of elections
6. Statutory Report of President on State of Union
7. Report of Finance Committee
8. Biennial Report of Treasurer and accounts for 1989–90/Appointment of auditors for 1991–92
9. Reports of division/section presidents
10. Report of Publications Committee
11. Report of CHEMRAWN Committee
12. Report of Committee on Chemistry and Industry
13. Report of Committee on Teaching of Chemistry
14. Report on Affiliate Membership Programme
15. Proposed changes to statutes and bylaws
16. Vice-Presidential critical assessment of IUPAC programmes and projects, continuation/dissolution of existing IUPAC bodies and proposals for new bodies
17. Proposals formally received from National Adhering Organizations
18. Ratification of dates and places of 37th General Assembly and 34th Congress (1993)
19. Budget proposal for 1992–93 and national subscriptions for 1992–93
20. Important matters discussed by Bureau at 36th General Assembly not covered by items on Council agenda
21. Elections and approval of elected officers of divisions/sections
22. Provisional places of 38th General Assembly and 35th Congress (1995)
23. Applications for membership of IUPAC
24. Applications for Associated Organization status of IUPAC
25. Language for official records during 1991–95
26. Adoption of recommendations on nomenclature and symbols
27. Any other business (discussion only)

Officers and Bureau Members

One of the duties of Council at the 36th IUPAC General Assembly will be to elect officers of the Union and members of Bureau. Nominations for the various positions that fall vacant in 1991 were required by the Secretary General at the IUPAC Secretariat before 14 June 1991. The following are details of candidates who had been nominated by the time this issue went to press (15 April 1991).

President

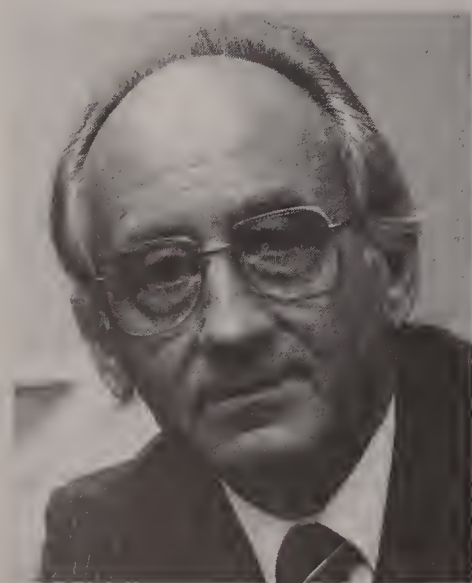
Prof. A. J. Bard (USA)

Prof. A. J. Bard, Vice-President and President-Elect, becomes President at the close of the Council meeting in Hamburg. He will hold office as President until the close of the Council meeting held at the next IUPAC General Assembly which will be held in Lisbon, Portugal in 1993. A brief profile of Bard was published on pages 13–14 of the January 1990 issue of *CI*.

Vice-President

The Vice-President to be elected at the 36th General Assembly will be President-Elect and will become President at the close of the Council meeting held at the 37th General Assembly in 1993. By 15 April, two nominations had been received.

Prof. H. Staab (Germany)



Professor Heinz A. Staab was born on 26 March 1926.

The following are an outline of Staab's academic education and career: Universities Marburg, Tübingen (chemistry) and Heidelberg (medicine); Research Associate, Max-Planck-Institute Heidelberg (1953–57); 1957 Dozent (= Assistant Professor) (1957–61); Associate Professor (1962), Professor of Chemistry, University Heidelberg (1963–present); Director, Institute of Organic Chemistry, U. Heidel-

berg (1964–76); Director, Department of Organic Chemistry, Max-Planck-Institute for Medical Research (1977–present); Dean, Faculty of Science and Mathematics (1968); Prorektor (= Vice-President) (1969); University of Heidelberg; President, Max-Planck-Gesellschaft (1984–90).

He has held the following posts in scientific institutions: Deutsche Forschungsgemeinschaft (Member and Chairman, Committee of Chemistry 1968–76); Senator (1976–82 and 1984–90); German Science Council Member (1975–78); Chairman, Research Council (1976–78); Alexander von Humboldt Foundation Member, Fellowship Committee (1974–81); Board Member (1984–90); President, Gesellschaft Deutscher Naturforscher und Ärzte (1981–82); President, Gesellschaft Deutscher Chemiker (German Chemical Society (1984–85); Chairman, Deutscher Zentrallausschuß für Chemie (German Central Committee for Chemistry) (1986–present); Member, Supervisory Boards of DEGUSSA AG and BAYER AG, etc.

His international activities include: visiting professorships and special lectureships in Australia, China, India, Israel, Japan, Poland, USSR, United Kingdom, United States; Scientific Councillor, Institute of Molecular Sciences Okazaki (1987–89); Member, Advisory Council RIKEN Institute for Chemistry and Physics, Wako/Japan (1987–present); Bureau Member, IUPAC (1987–present).

In 1970 Staab was made a Member of the Academy of Sciences Heidelberg (1973–76 Chairman, Science Section), in 1974 a Member of the Academia Leopoldina (1978–present Senator and Chairman, Section of Chemistry), in 1979 he was given the Adolf von Baeyer Medal, Gesellschaft Deutscher Chemiker and in 1984 was made a Doctor of Philosophy honoris causa (Weizmann Institute Rehovot). He has also been a member of the Academia Europaea (Founding Member, Executive Council 1988–89), the Austrian Academy of Sciences (1988), an Honorary Fellow of the Indian Academy of Sciences (1988), a Member of the Bavarian Academy of Sciences (1969) and an Honorary Senate Member of the Max-Planck-Society (1990).

Staab has written two books and 300 scientific publications in the field of physical, synthetic and

bio-organic chemistry, has been Co-editor of *Liebigs Annalen der Chemie* (1965–today) and an honorary regional Editor (1972–80) and Member of the International Advisory Board (1980–today) of *Tetrahedron* and *Tetrahedron Letters*.

Prof. C. Zhang
(Chinese Chemical Society, Beijing)



Professor Cunhao Zhang was born on 23 February 1928 in Tianjin, China. He is married. He graduated with a B.Sc. from the National Central University, Nanjing, China in 1947 and gained an M.Sc. from the University of Michigan in 1950.

He was an Assistant Professor (1951–53) at the Dailian Institute of Chemical Physics, an Associate Professor in 1953–62, and has been a Professor since 1962. He was a Director in 1986–90. He has been a Member of Chinese Academy of Sciences (CAS) since 1981, a Standing Member, Chemistry Division of the CAS since 1983, a part-time Professor, Nanjing and Fudan Universities since 1988 and a Director of the National Natural Science Foundation of China since 1991.

Professor Zhang has been a Standing Council Member of Chinese Chemical Society (1986–90), a Council Member of the Optical Society of China (1982–88), a Member of the Optical Society of America and an Associate Member of the IUPAC Commission on Molecular Structure and Spectroscopy (1989–93).

Activities in recent years: membership of the Advisory Editorial Board of *Spectrochimica Acta, Part A* (Oxford, New York), the International Advisory Board of *JCS, Faraday Transactions*, an Associate Editorship of *Science* (China), the *Chinese Journal of Lasers* (1982–90) and *Acta Chimicophisica Sinica* and membership of the Editorial Board of *Acta Physicochimica Sinica*. He was invited speaker at the IQEC San Francisco Conference, June 1986, co-author of paper at IQEC Tokyo Conference, July 1988 and presented seminars at MIT, UC Berkeley, UCLA and USC (May–June 1985), Stanford, UC Berkeley, University of Minnesota and

MIT (July–August 1988), MPQ, Garching and Heidelberg University (September 1988) and IMS, Okazaki, Riken and IRI, Tokyo (January 1988).

Publications: 72 papers on liquid fuels, chemical laser systems and spectroscopy.

Past-President

Prof. Y. P. Jeannin (France)

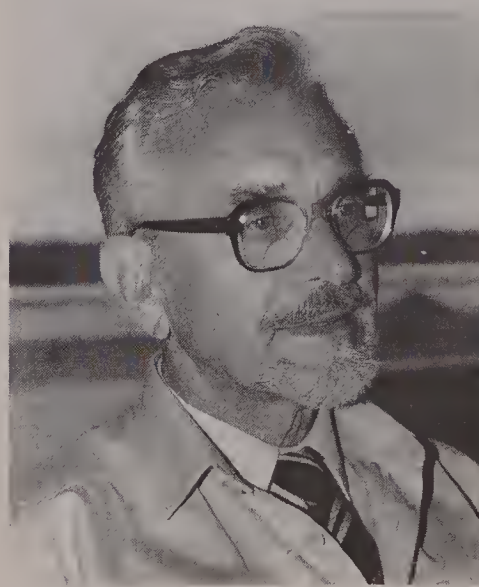
The retiring President, Prof. Y. P. Jeannin, remains a member of the Bureau for a period of two years. The Past-President is not an officer of the Union.

Secretary General

There is a vacancy for this office. At the time of going to press no nominations had been received.

Treasurer

Prof. J. Ward (UK)



The start of John Mason Ward's working life in paper manufacturing was interrupted by World War II when he was directed to work on chemical defence at Porton Down. At the end of the war he joined the Electricity Supply Industry to work on washing processes to remove sulphur from flue gases.

In 1949 he was appointed to a group of about a dozen research scientists and engineers at the Central Electricity Research Laboratories, Leatherhead, to build up a chemistry research team. When he retired as Research Manager and Head of Chemistry Division, over 800 personnel were employed in the laboratories of whom about 80 were in the Chemistry Division. In the early days he was also responsible for building up materials and biology groups which later became independent divisions.

The principal subjects of research by the Chemistry Division were atmospheric pollution, removal of sulphur from flue gases, analytical methods and instruments for monitoring micro quantities of impurities in boiler feed water and

corrosion at high temperature and pressures in conventional and nuclear power stations. Ward and his team were awarded the Royal Society – Esso Gold Medal in 1977 for their work on corrosion prevention.

In 1969 he was appointed Visiting Professor in the Chemistry Department of the University of Surrey – an appointment he still holds in an honorary capacity.

Since 1964, he has held various offices in the Royal Institute of Chemistry and the Royal Society of Chemistry including: Vice-President, Royal Institute of Chemistry (1970–72); Honorary Treasurer, Royal Institute of Chemistry (1976–80); Honorary Treasurer, Royal Society of Chemistry (1980–86); and President, Royal Society of Chemistry (1988–90).

Ward joined the IUPAC Finance Committee in 1986 and succeeded Dr Fred Wilson as Chairman in 1990.

He is married to Gwenda and has a daughter, two sons and four grandchildren. The eldest son and two grandsons live in New Jersey, USA.

Amongst his recreations are collecting antique furniture and water colours, fly fishing and missing pheasants and partridges.

Bureau

The Bureau consists of the Officers, the immediate Past-President, the presidents of the divisions/sections, together with not less than 10 other members elected by Council. These are known as 'elected members'. At the conclusion of the 35th General Assembly in Lund, there were 12 elected members of the Bureau. At the 36th General Assembly the Bureau will make recommendations to Council as to the number of elected members (10 or more), who should be on the Bureau for the succeeding 2 years.

Elected members are elected for a period of four years and are eligible for election for a second period of 4 years. No adhering organization shall have more than one elected member of the Bureau. Statute 7.2 also states that 'the principle of fair geographical representation of members shall be taken into account.'

- *Elected members of Bureau, retiring in 1991, who are not eligible for re-election, but may be nominated for another office:*

Prof. A. J. Arvia (Argentina)

- *Elected members of Bureau, retiring in 1991, who are eligible for re-election for a further 4-year period:*

Prof. M. T. Beck (Hungary) Prof. N. Sheppard (UK)

Prof. J. Jortner (Israel) Prof. H. A. Staab (Germany)

Prof. G. Modena (Italy)

- *Elected members of Bureau, who were elected at the 35th General Assembly until 1993:*

Prof. R. D. Brown (Australia) Prof. S. Itô (Japan)

Dr Mary L. Good (USA) Prof. I. Wadsö (Sweden)

Prof. W. -Y. Huang (China) Prof. K. I. Zamaraev (USSR)

At least four elected members of the Bureau must be elected at the 36th General Assembly in Hamburg, i.e. the minimum number of 10 elected members less the six elected members who continue in office until 1993. By 15 April the following nominations had been received:

Prof. M. T. Beck (Hungary)



Professor M. T. Beck was born on 14 November, 1929 at Szöreg, Hungary. He is married with two children. He graduated with a B.Sc. in 1952 from the University of Szeged taking his Ph.D. in 1957. He was awarded a D.Sc. in 1963 from the Hungarian Academy of Sciences in Budapest.

Positions held: demonstrator at the University of Szeged (1950–52), research chemist at the same University (1952–68). He was made Professor of Physical Chemistry at Kossuth Lajos University, Debrecen (1968), Vice Rector (1981–89), Rector (1987).

Memberships and honours: titular member of the IUPAC Commission of Equilibrium Data (1965–79), Corresponding member of the Hungarian Academy of Sciences (1973), a full member (1979), Chairman of the Chemistry Section of the Hungarian Academy of Sciences (1976–85); Fellow of the Royal Society of Chemistry (1981), Honorary Member of the Finn Academy of Sciences (1984), Foreign member of the Akademie der Wissenschaften der DDR (1985), Member of the Mediterranean Academy of Sciences (1988), Member of the Bureau of IUPAC (1987–present).

Fields of research: thermodynamic and kinetic study of reactions of metal complexes; mechanisms of redox reactions; catalytic activity of metal complexes; prebiotic coordination chemistry, periodic reactions, analytical chemistry.

Publications: Chemistry of Complex Equilibria (1965 in Hungarian, 1970 in English; 1973 in Russian; Second, revised and updated edition (co-author I. Nagypál) 1989 in English and in Russian); *Science and Pseudoscience* (1977) in Hungarian, 2nd edition 1978); 250 papers in: *Inorganica Chimica Acta*, *Acta Chimica Hungarica*, *Acta Chimica Scandinavia*, *Journal of Inorganic and Nuclear Chemistry*, *Journal of the American Chemical Society*, *Analytica Chimica Acta*, *Journal of Coordination Chemistry*, *Coordination Chemistry Review*, *Journal of Physical Chemistry*, *Nature*.

Editorial work: Proceedings of the Tihany Symposium on Coordination Chemistry (1963) and *Proceedings of the 3rd Symposium on Coordination Chemistry, Debrecen* (1970). Member of the editorial boards of *Journal of Coordination Chemistry*, *Acta Chimica Hungarica*, *Reaction Kinetics and Catalysis Letters*, *Scientometrics*, *Magyar Tudomány* and *Kémiai Közlemények*.

Hobbies: History of science, numismatics, tennis.

Prof. A. Chakravorty (India)



Professor Animesh Chakravorty is Head of the Department of Inorganic Chemistry, Indian Association for the Cultivation of Science, Calcutta 700 032, India. He was born on 30 June 1935 at Mymensingh, Bangladesh. He graduated with an M.Sc. from Calcutta University in 1957 where he was awarded a Ph.D. in 1961. He was a Research Associate at MIT and Harvard University in 1961–64.

Positions held: Lecturer, Assistant Professor, Professor, Head of Chemistry Department at Indian Institute of Technology, Kanpur (1964–77); Visiting Professor at Texas A & M University, College Station, Texas, USA (1983).

Fellowships: Indian National Science Academy; Indian Academy of Sciences.

Memberships: Royal Society of Chemistry, Indian Science Congress.

Editorial boards: at different times — *Inorganica Chimica Acta*; *Indian Journal Chemistry*; *Proceed-*

ings of the Indian Academy of Sciences; *Proceedings of the Indian National Science Academy*.

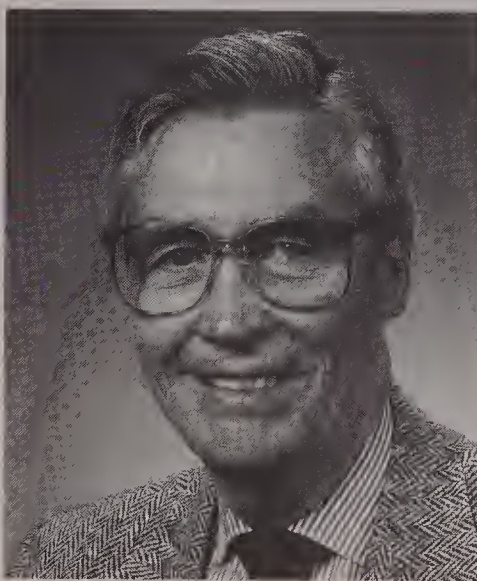
Awards: Shanti Swarup Bhatnagar Prize (CSIR); T. R. Seshadri Commemoration Medal (INSA); Honorary Professor, Jawaharal Nehru Centre for Advanced Scientific Research, Bangalore.

Committee work: numerous national committees and councils of CSIR, UGC, DST, INSA, Indian Academy of Sciences, etc.

Current research interest: general field — inorganic chemistry, organometallic chemistry and bio-inorganic chemistry; synthesis, structure and redox reactions; model studies on structure and function of metal complexes in living systems.

Publications: about 180 original research papers and several review articles.

Dr R. Marchessault (Canada)



Dr Robert H. Marchessault was born in Montreal, Quebec on 16 September, 1928. He is married.

Education: B.Sc. University of Montreal (1950); Ph.D. McGill University, Montreal (1954)

Positions: Postdoctoral studies at McGill University and University of Uppsala (Sweden) (1954–55); Research Scientist, Group Leader, Research Associate, American Viscose Corporation, Marcus Hook, Pennsylvania, USA (1954–61); Professor of Polymer Physical Chemistry, State University of New York, Forest Chemistry Department, College of Forestry, Syracuse, New York, USA (1961–69); Professor Associé, University of Strasbourg, France (1967–68); Director and Professor, Chemistry Department, Université de Montreal (1969–78); Vice-President, Xerox Corporation and Manager of Xerox Research Centre of Canada (1978–79); Officer of Xerox Canada Inc. (1979–89); Member of Board, Polysar Corp., Sarnia, Ontario (1985–87); Professor, Chemistry Department, McGill University and holder of NSERC–Xerox Chair (since 1987); Member of National Advisory Board of Science and Technology (1987–88).

IUPAC activities: Chairman, IUPAC Subcommittee on 'Nomenclature conformation of polysacchar-

ides' (1971–79); Member of Canadian National Committee for IUPAC and official delegate to General Assembly in Denmark (1983); Member of Executive and Organizing Committee and Member of Program Committee, 28th IUPAC Congress (1981); Associate Member of Commission on Macromolecular Nomenclature (1980); Secretary/Member of CHEMRAWN Committee (since 1982); Member of the *Chemistry International* Editorial Advisory Board (since 1985); John and Michael Polanyi Lecture sponsored by IUPAC National Committee, Montreal (1991).

Publications: 189 publications in the polymer field in internationally recognized journals.

Prof. G. Modena (Italy)



Professor Giorgio Modena was born in Ancona, Italy, in 1924 and studied at the University of Bologna obtaining the degree of 'Dottore in Chimica Industriale' in 1947. He carried on with research work at the University and obtained his first teaching appointment there. In 1963, he was appointed to the Chair of Organic Chemistry at the University of Bari and then, in 1967, moved to the University of Padua where he is Professor of Organic Chemistry.

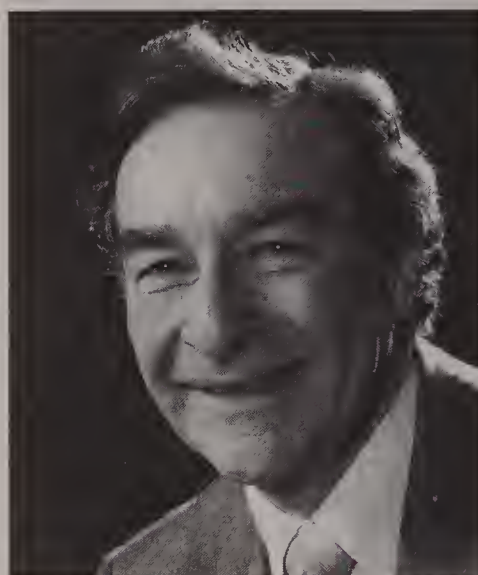
Modena's scientific research activities have been mainly concerned with the study of organic reaction mechanisms. In 1956, during a postdoctoral research fellowship at University College, London, he started work with Dr A. D. Allen, under the supervision of Prof. E. D. Hughes, on nucleophilic substitution of silicon. At that time Prof. Sir Christopher Ingold was Head of the Chemistry Department.

His work on the chemistry of sulphenyl-halides led to the synthesis of the first thiirenium ions. He has also worked on vinyl cation chemistry and, in particular, nucleophilic substitution on vinylic carbon. Other long-term interests have been oxidation and peroxide chemistry, the chemistry of sulphur-organic compounds and the protonation behaviour of weak bases in strong acids.

Modena has been active as an organizer of and participant at several international congresses. He has also been particularly active in the Italian Chemical Society (SCI) of which he has been a member since the forties. He was its Vice-President (1977–79). He has also served (1981–88) as Chairman of the Chemical Science Committee of the Italian National Research Council (CNR, Rome). In addition, he is a member of the National Academy of Science, Rome and Correspondent Member of the Istitute Veneto di Science, Lettere ed Arti.

In 1975 Modena was elected Titular Member of the Organic Chemistry Division Committee. He served as Secretary of the Committee (1979–81), Vice-President (1981–83) and President (1983–85). He is currently an elected member of Bureau (1987–91) and Chairman of the Italian National Committee for IUPAC.

Prof. N. Greenwood (UK)



Norman Greenwood was born in Melbourne, Australia in 1925 and studied at the University of Melbourne (MSc. 1948, D.Sc. 1966) and Cambridge University (Ph.D. 1951, Sc.D. 1961). He was awarded the D. de l'Univ. *honoris causa* of the University of Nancy, France in 1977 and was elected to Fellowship of the Royal Society in 1987. He has been particularly active in both teaching and research and is well known for his work on national and international committees. He retired last year as Professor of Inorganic and Structural Chemistry in the University of Leeds and is now Emeritus Professor of Chemistry. He was Dean of the Faculty of Science at Leeds (1986–88) and has held visiting professorships in Australia, Canada, Denmark, Japan and USA.

Prof. Greenwood has made numerous contributions to solid-state chemistry and his book *Ionic Crystals, Lattice Defects and Nonstoichiometry* (1968) had considerable impact, being translated into German, Japanese and Spanish. He was one of the first to apply the Mössbauer effect to the study of chemical problems and coauthored a definitive

monograph on the subject in 1971. More recently he has made major contributions to the reaction chemistry and structures of the boron hydrides and has opened up the new field of polyhedral metallaborane cluster chemistry. In all he has published some 430 research papers and 10 books, the most recent of which, *Chemistry of the Elements*, broke new ground as a university text book and has already been translated into several other languages. Prof. Greenwood has received many national and international honours and awards. He is a past President of the Dalton Division of the Royal Society of Chemistry and is currently President of the British Association for the Advancement of Science, Section B (Chemistry).

Norman Greenwood has been active in IUPAC affairs for many years. He has been Chairman of the Commission on Atomic Weights (1969–75) and President of the Inorganic Chemistry Division (1977–81). Most recently he has (with Professor Yves Jeannin) been one of the two IUPAC members of the joint IUPAP–IUPAC Transfermium Working Group on Criteria for the Discovery of Chemical Elements. He is strongly committed to the present move to modernize and develop IUPAC structures so as to make the Union more effective in dealing with emerging needs in the coming years.

We regret to record the deaths of

Prof. J. S. Anderson, UK (25 December 1990) — Inorganic Chemistry Division Committee (1963–67)

Prof. G. Smets, Belgium (28 January 1991) — President of IUPAC (1977–79), Bureau (1969–75), Commission on Macromolecules (1965–67), Secretary of Macromolecular Division (1967–75), Commission on Macromolecular Nomenclature (1968–75).



Prof. G. Smets

Information for Affiliates

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in blue and black on a white background and is approximately 42 × 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Free copies of booklet available to affiliates

Copies of an attractive 64-page illustrated booklet on *The IUPAC programme on chemistry and the environment* have been distributed to member of IUPAC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Secretary.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International (CI)*, please indicate that the letter is 'Submitted for publication in *CI*'.

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2–3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF
UK

Tel: +44 (865) 747744
Fax: +44 (865) 747510
Telex: 83220 IUPAC G

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually, but not always, announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal.

Ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon *or* navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 88 of the July 1990 issue of *CI*. Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC commissions. A full list of names and addresses of all commission officers for 1989–91 was published on pages 225–235 of the November 1989 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

IUPAC-sponsored conference

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Mongolian affiliates



БНМАУ

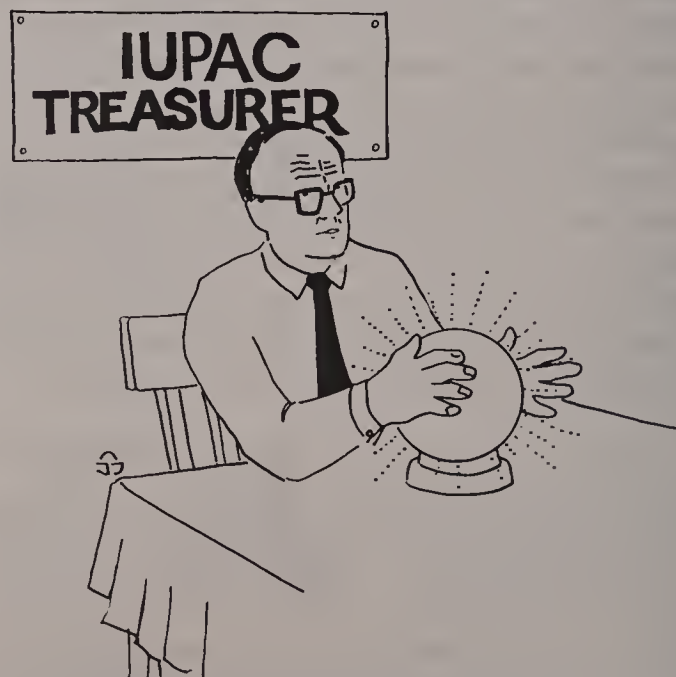
ШИНЖЛЭХ УХААНЫ АКАДЕМИЙН ДЭРГЭДЭХ
МОНГОЛЫН ХИМИЧДИЙН ШИНГЭМЛЭГ

ХИМИЧЕСКОЕ ОБЩЕСТВО МОНГОЛЬСКОЙ
НАРОДНОЙ РЕСПУБЛИКИ

Professor D. Badgaa, President of the Chemical Society of the Mongolian Peoples Republic, has submitted to the IUPAC Secretariat a list of 25 young Mongolian chemists for registration as affiliates for 1991. The affiliates are being sponsored by IUPAC under the affiliate programme of assistance for young chemists in developing countries.

Treasurer gazes into a crystal ball

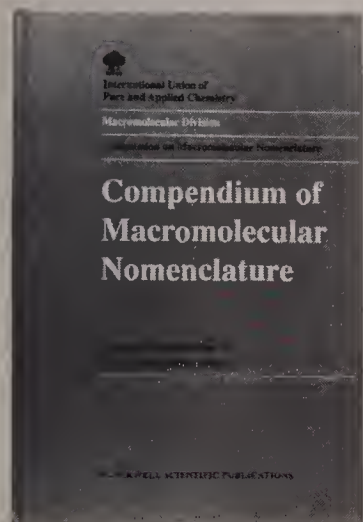
In this issue of the magazine the IUPAC Treasurer, Prof. Anders Björkman, gazes into his crystal ball and makes predictions for the future of IUPAC. His tidings on 'Science, finance and forward planning' appear on pages 143–147. He concludes that if IUPAC is to maintain current activities, subscriptions must be raised and expenditure decreased.



Compendium of Macromolecular Nomenclature

W. Val Metanomski

The first edition of *Compendium of Macromolecular Nomenclature* (the Purple Book) issued by the IUPAC Commission on Macromolecular Nomenclature (IV.1) was published in January this year. W. Val Metanomski, who prepared this edition for publication, outlines its history, purpose and contents.



Title cover of the compendium

Introduction

In January 1991, the Purple Book joined a large family of the IUPAC nomenclature and terminology compendia consisting of the Blue Book (organic chemistry), the Red Book (inorganic chemistry), the Orange Book (analytical chemistry), the Green Book (physical chemistry), and the Gold Book (overall chemistry).

The first IUPAC publication on macromolecular nomenclature was issued in 1952 by the Subcommittee on Nomenclature of the IUPAC Commission on Macromolecules. It was a first attempt to systematize the naming of macromolecules and the use of symbols and terms in polymer science. Whilst the report itself was only partially accepted, it drew attention to the obvious need for nomenclature in the field and paved the way to development of modern polymer nomenclature by a new IUPAC body, the Commission on Macromolecular Nomenclature, constituted in 1968.

Under the chairmanship of Dr Kurt L. Loening (1968–77), Professor Aubrey D. Jenkins (1977–85), and Dr Pavel Kratochvil (1985–91), the commission produced a series of rules and definitions that has shaped modern macromolecular nomenclature and placed it on a systematic basis. As early as in 1981, the commission decided to seek publication of a bound volume on polymer nomenclature, but the desire to include many recommendations then in various stages of preparation and review delayed the submission of the complete manuscript until late 1989. The final stamp of approval was given at the commission's meeting in July 1990 (see photograph).

The Purple Book contains

History of the Commission on Macromolecular Nomenclature

Membership of the Commission on Macromolecular Nomenclature

Introduction to Macromolecular Nomenclature

DEFINITIONS

1. Basic definitions of terms relating to polymers
2. Stereochemical definitions and notations relating to polymers
3. Definitions of terms relating to individual macromolecules, their assemblies, and dilute polymer solutions
4. Definitions of terms relating to crystalline polymers

NOMENCLATURE

5. Nomenclature of regular single-strand organic polymers
6. Nomenclature for regular single-strand and quasi-single-strand inorganic and coordination polymers
7. Source-based nomenclature for copolymers
8. A classification of linear single-strand polymers
9. Use of abbreviations for name of polymeric substances.

APPENDIX

Bibliography of biopolymer-related IUPAC–IUB nomenclature recommendations.



The Commission on Macromolecular Nomenclature (IV.1) at its meeting in Montreal, Canada in July 1990.

The compendium, the first major compilation of the commission, consists of an introduction to macromolecular nomenclature and nine chapters corresponding to the currently valid recommendations (see box). Included are also a history of the commission and the list of its members for the period 1968–91. The latter is intended to recognize individual and collective efforts that went into the preparation of individual recommendations and of the compendium.

Introduction of macromolecular nomenclature

Written by Norbert M. Bikales, the commission's secretary (1979–87), this tutorial introduction highlights the important precepts of polymer nomenclature and describes them in a fashion less formal than that customarily employed in the official rules and recommendations.

Especially useful is contrasting and comparing between the source-based and structure-based names. Traditionally, polymers have been described in terms of starting materials (monomers) from which they are prepared. As the structures of polymers became elucidated and the researchers started to report them, the need arose for structure-based names corresponding to constitutional repeating units, even if in some cases structural representations were somewhat idealized. It has to be remembered that unlike well-defined and well-characterized low-molecular-weight compounds, polymers do not consist of identical molecules, but are mixtures of molecules of different molecular weights, and different sequences and shapes.

Examples of source-based names for various type of copolymers (see Extract 1), and of both structure- and source-based names for some common polymers (see Extract 2) are conveniently tabulated. The introduction also explains and gives examples for some basic stereochemical definitions and notations. The references provide a complete historical account of the commission's recommendations with a proper identification of the current status of each.

3.1 General and thermodynamic terms

Term	Definition
3.1.1 dilute solution	A solution in which the sum of the volumes of the domains occupied by the solute molecules or particles is substantially less than the total volume of the solution. <i>Note</i> The term 'domain' refers to the smallest convex body that contains the molecule or particle in its average shape.
3.1.2 cross-over concentration	recommended symbol c^* The concentration range at which the sum of the volumes of the domains occupied by the solute molecules or particles in solution is approximately equal to the total volume of that solution. <i>Note</i> For the meaning of the term 'domain', see the note in Definition 3.1.1.
3.1.3 polymer-solvent interaction	The sum of the effects of all intermolecular interactions between polymer and solvent molecules in solution that are reflected in the Gibbs and Helmholtz energies of mixing.
3.1.4 quality of solvent, thermodynamic quality of solvent	Qualitative characterization of the polymer-solvent interaction (see Definition 3.1.3). A solution of a polymer in a 'better' solvent is characterized by a higher value of the second virial coefficient (see Definition 3.1.7) than a solution of the same polymer in a 'poorer' solvent.
3.1.5 theta state	The state of a polymer solution for which the second virial coefficient (see Definition 3.1.7) is zero.

Extract 2. Part of page 5. Examples of structure and source-based names for common polymers.

Extract 1. Page 3. Examples of copolymer types and names.

Table i. IUPAC nomenclature of copolymers [10]

Type	Arrangement of monomeric units	Representation	Connective	Example	
				Name	Alternative name
unspecified	unknown or unspecified	(A-co-B)	-co-	poly[styrene-co-(methyl methacrylate)]	copoly(styrene methyl methacrylate)
statistical	obeys known statistical laws	(A-stat-B-stat-C)	-stat-	poly(styrene-stat-acrylonitrile-stat-butadiene)	stat-copoly(styrene acrylonitrile butadiene)
random	obeys Bernoullian statistics	(A-ran-B)	-ran-	poly[ethylene-ran-(vinyl acetate)]	ran-copoly(ethylene vinyl acetate)
alternating	alternating sequence	(AB) _n	-alt-	poly[(ethylene glycol)-alt-(terephthalic acid)]	alt-copoly(ethylene glycol terephthalic acid)
periodic	periodic with respect to at least three monomeric units	(ABC) _n (ABB) _n (AABB) _n (ABAC) _n	-per-	poly[formaldehyde-per-(ethylene oxide)-per-(ethylene oxide)]	per-copoly(formaldehyde ethylene oxide ethylene oxide)
block	linear arrangement of blocks	AAAAA-BBBBBB-	-block-	polystyrene-block-polybutadiene	block-copoly(styrene butadiene)
graft	polymeric side chain different from main chain [a]	AAAAAAAAAAAAA- B B B B 	-graft-	polybutadiene-graft-polystyrene	graft-copoly(butadiene styrene)

[a] Main chain (or backbone) is specified first in the name.

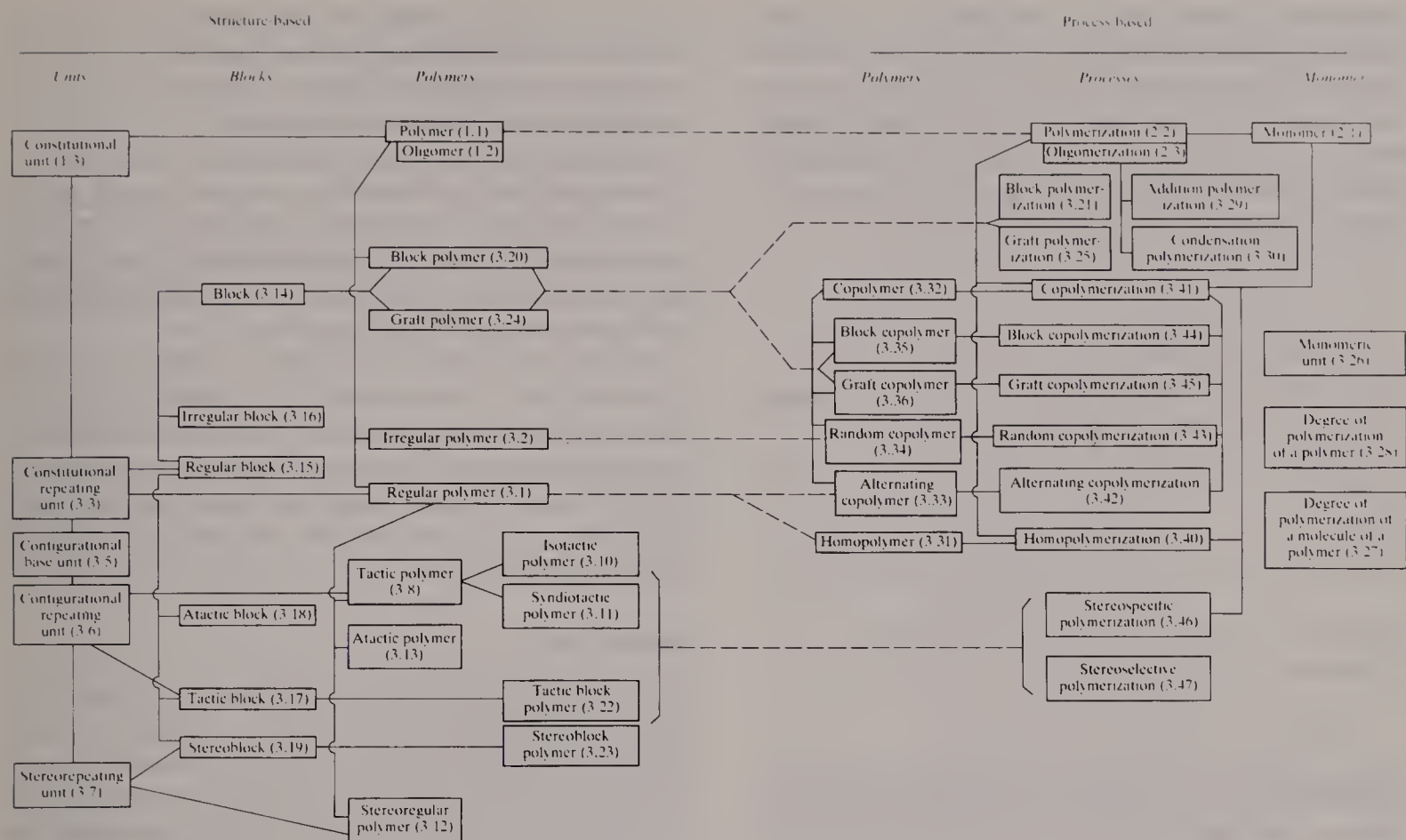


Fig. 1.1 Interrelationships among basic definitions of terms relating to polymers.

Extract 3. Page 14. Interrelating between basic definitions.

Definitions

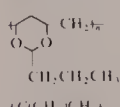
Chapter 1 is the most fundamental document as it contains definitions of 53 terms presented in two sets, one based on the structures of polymer molecules and the other on the processes by which polymeric substances come into being. A diagram clearly indicates interrelationships among these basic definitions (see Extract 3).

Chapter 2 presents stereochemical definitions and notations. It provides basic definitions for configurational base unit and configurational repeating unit, and treats the concept of tacticity in considerable detail. Constitutional and configurational sequences are next defined and illustrated, as well as relative configurations. Finally, designations of conformation of polymer molecules followed by specific terminology for crystalline polymers are presented.

Chapter 3 provides definitions for 122 physicochemical terms relating to individual macromolecules, their assemblies, and dilute polymer solutions. Included is terminology for molecular weight, molecular-weight averages, distribution functions, radius of gyration, the Flory–Huggins theory, viscosity of solutions, scattering of radiation by polymers, etc. Definitions are often accompanied by recommended symbols, notes, and cross-references (see Extract 4).

Chapter 4 provides definitions for 54 terms relating to the structure of crystalline polymers and

Table ii. Examples of structure-based and source-based names for some common polymers [6a]

Structure	Structure-based name	Source-based or trivial name
$+CH_2CH_2+_n$	poly(methylene)	polyethylene
$+CHCH_2+_n$	poly(propylene)	polypropene
$+CH(CH_3)CH_2+_n$	poly(1,1-dimethylethylene)	polyisobutylene
$+C(CH_3)=CHCH_2+_n$	poly(1-methyl-1-butenylene)	polyisoprene
$+CHCH_2+_n$ 	poly(1-phenylethylene)	polystyrene
$+CHCH_2+_n$ 	poly(1-chloroethylene)	poly(vinyl chloride)
$+CHCH_2+_n$ 	poly(1-cyanoethylene)	polyacrylonitrile
$+CHCH_2+_n$ 	poly(1-acetoxyethylene)	poly(vinyl acetate)
$+CF_2CH_2+_n$	poly(1,1-difluoroethylene)	poly(vinylidene fluoride)
$+CF_2CF_2+_n$	poly(difluoromethylene)	polytetrafluoroethylene
 $+CH_2CH_2+_n$	poly[(2-propyl-1,3-dioxane-4,6-diyl)methylene]	poly(vinyl butyral)
$+C(CH_3)(COOCH_3)CH_2+_n$	poly[1-(methoxycarbonyl)-1-methylethylene]	poly(methyl methacrylate)
$+OCH_2CH_2+_n$	poly(oxyethylene)	poly(ethylene oxide)
$+O$  $_n$	poly(oxy-1,4-phenylene)	poly(phenylene oxide)

Extract 4. Part of page 57. Examples of general and thermodynamic terms for dilute polymer solutions.

the process of macromolecular crystallization. The recommendations deal primarily with crystal structures that are comprised of essentially rectilinear, parallel-packed polymer chains, and

secondarily, with those comprised of so-called globular macromolecules. Five sections deal successively with general definitions, local structural arrangement at the scale of a few bond lengths, morphological aspects, molecular conformation within crystals (see Extract 5), and kinetic aspects of crystallization.

4 TERMINOLOGY RELATING TO MOLECULAR CONFORMATION WITHIN POLYMER CRYSTALS [9,10]

Term	Definition
4.1 tie molecule	A molecule that connects at least two different crystals.
4.2 stem	A crystallized, rodlike portion of a polymer chain connected to non-rodlike portions, or chain ends, or both.
4.3 chain folding	The conformational feature in which a loop connects two parallel stems belonging to the same crystal.
4.4 fold	The loop connecting two different stems in a folded chain.
4.5 fold plane	A crystallographic plane defined by a large number of stems that are connected by chain folds.
4.6 fold surface	A surface approximately tangential to the folds.
4.7 fold domain	A portion of a polymer crystal wherein the fold planes have the same orientation.

Note

The sectors of lamellar crystals frequently represent fold domains.

Extract 5. Part of page 83. Examples of terms for molecular conformation within polymer crystals.

Nomenclature

Chapter 5 states the fundamental principles and the basic rules of the structure-based nomenclature. These rules are designed to name, uniquely and unambiguously, the structures of regular single-strand organic polymers whose repeating structures can be portrayed as a chain of structural or constitutional repeating units. Detailed extensions and applications are provided for numerous cases involving chains containing heterocycles, heteroatoms, carbocycles, and acyclic carbon atoms only; chains containing substituents and end groups; and salts and onium compounds of polymers.

Chapter 6 presents a system designed to name regular inorganic and/or coordination linear polymers, the constituent units of which can be formulated according to usual chemical principles of covalent and/or coordinate bonding. The structures considered are those which can be described by a constitutional repeating unit with at least one terminal unit that is connected through only one atom to other identical constitutional repeating units or to an end group. The original document was prepared jointly with the IUPAC Commission on the Nomenclature of Inorganic Chemistry (II.1).

Chapter 7 provides source-based nomenclature for copolymers which takes into account the kind of arrangement in which various types of monomeric units are related to each other. Seven types of separate arrangements have been defined (see Extract 1). If known, information on mass fractions,

mole fractions, molar masses, relative molecular masses, and degrees of polymerization can be included. For simple cases, a concise alternative nomenclature system is also given.

Chapter 8 presents a classification scheme for linear single-strand organic and inorganic polymers, which is a hierarchical scheme (classes, subclasses, groups, and individual polymers) based on the chemical constitution of the repeating units in the main chain (backbone).

Chapter 9 contains lists of both IUPAC- and ISO (International Organization for Standardization)-recommended abbreviations for names of polymeric substances. The commission emphasizes the IUPAC policy which states the need for defining each abbreviation the first time it appears in the text of scientific papers.

Appendix

The highly specialized nomenclature of biological macromolecules has not been included in the compendium. The commission, on the other hand, provides a reprint of the bibliography of IUPAC-IUB (International Union of Biochemistry) nomenclature recommendations for amino acids and peptides; nucleic acids and polynucleotides; and oligo- and polysaccharides. The list was prepared by Dr H. B. F. Dixon, former chairman of the IUB-IUPAC Joint Commission on Biochemical Nomenclature (JCBN).

Translation

Translation of commission's recommendations into other languages, all done under the auspices of and approved by the IUPAC National Adhering Organizations, have not been included in the compendium.

For the convenience of the international readership, they are listed here. For the sake of completeness, references to the first publication of each recommendation in *Pure and Applied Chemistry (PAC)* are included.

Chapter 1. 'Basic Definitions of Terms Relating to Polymers 1974', *PAC*, Vol. 40, pp. 477–491, 1974.

1. *Hua Hsueh*, Vol. 40, No. 2, pp. A58–A66, 1982 (in Chinese).
2. *Chem. Listy*, Vol. 79, pp. 281–295, 1985 (in Czech).
3. *Makromol. Chem.* Vol. 180, Appendix to No. 9, pp. 1–15, 1979 (in French)*
4. In: *Regeln für die Nomenklatur der polymere*, pp. 5–23. Verlag Chemie, Weinheim, 1978 (in German).**
5. *Kobunshi*, Vol. 25, pp. 534–541, 1976 (in Japanese).
6. *Kobunshi Jikkengaku*, Vol. 1, pp. 390–396, 1979 (in Japanese).
7. *Polimery (Warsaw)*, Vol. 31, pp. 176–

- 180, 1987 (in Polish).
8. *Vysokomol. Soedin., Ser. A*, Vol. 20, pp. 1167–1177, 1978 (in Russian).
 9. In: *Nomenklturnye Pravila IYUPAK po Khimii*, Tom 3, *Organicheskaya Khimiya. Vysokomolekulyarnye Soedineniya*, Polutom 2, pp. 265–296. VINITI, Moskva, 1983 (in Russian).
- Chapter 2. 'Stereochemical Definitions and Notations Relating to Polymers (Recommendations 1980)' *PAC*, Vol. 53, pp. 733–753, 1981.
1. *Makromol. Chem.* Vol. 183, Appendix to No. 2, pp. 1–30, 1982 (in French).
 2. *Kobunshi*, Vol. 32, pp. 443–447, 1983 (in Japanese).
 3. *Polimery (Warsaw)*, Vol. 31, pp. 213–222, 1986 (in Polish).
 4. *Vysokomol. Soedin., Ser. A*, Vol. 24, pp. 198–219, 1982 (in Russian).
 5. In: *Nomenklturnye Pravila IYUPAK po Khimii*, Tom 3, *Organicheskaya Khimiya. Vysokomolekulyarnye Soedineniya*, Polutom 2, pp. 329–362, VINITI, Moskva, 1983 (in Russian).
- Chapter 3. 'Definitions of Terms Relating to Individual Macromolecules, Their Assemblies, and Dilute Polymer Solutions (Recommendations 1988)' *PAC*, Vol. 61, pp. 211–241, 1989
1. [of the 1985 draft]: *Polimery (Warsaw)*, Vol. 34, pp. 127–130, 176–179, 224–227, 1989 (in Polish).
 2. *Makromol. Chem.* Vol. 191, Appendix to No. 6, pp. XXIII–LXI, 1990 (in French).***
- Chapter 4. 'Definitions of Terms Relating to Crystalline Polymers (Recommendations 1988)' *PAC*, Vol. 61, pp. 769–785, 1989.
- Chapter 5. 'Nomenclature of Regular Single-Strand Organic Polymers (Rules Approved 1975)' *PAC*, Vol. 48, pp. 373–385, 1976.
1. *Chem. Listy*, Vol. 81, pp. 290–316, 1967 (in Czech).
 2. *Makromol. Chem.* Vol. 180, Appendix to No. 9, pp. 1–26, 1979 (in French).*
 3. In: *Regeln für die Nomenklatur der Polymere*, pp. 25–56. Verlag Chemie, Weinheim, 1978 (in German).**
 4. *Kobunshi*, Vol. 27, pp. 345–359, 1978 (in Japanese).
 5. *Kobunshi Jikkengaku*, Vol. 1, pp. 396–410, 1979 (in Japanese).
 6. *Pollimo-Polymer (Korea)*, Vol. 3, pp. 228–244, 1979 (in English).
 7. *Vysokomol. Soedin., Ser. A*, Vol. 20, pp. 1178–1197, 1978 (in Russian).
 8. In: *Nomenklturnye Pravila IYUPAK po Khimii*, Tom 3, *Organicheskaya*

Khimiya. Vysokomolekulyarnye Soedineniya, Polutom 2, pp. 265–296. VINITI, Moskva, 1983 (in Russian).

Chapter 6. 'Nomenclature for Regular Single-Strand and Quasi-Single-Strand Inorganic and Coordination Polymers (Recommendations 1984)' *PAC*, Vol. 57, pp. 149–168, 1985.

1. *Vysokomol. Soedin., Ser. A*, Vol. 28, pp. 1111–1129, 1986 (in Russian).

Chapter 7. 'Source-Based Nomenclature for Copolymers (Recommendations 1985)' *PAC*, Vol. 57, pp. 1427–1440, 1985.

1. *Chem. Listy*, Vol. 85, pp. 843–861, 1990 (in Czech).

2. *Kobunshi*, Vol. 35, pp. 880–892, 1986 (in Japanese).

3. *Makromol. Chem.* Vol. 191, Appendix to No. 6, pp. I–XXII, 1990 (in French).***

4. *Vysokomol. Soedin., Ser. A*, Vol. 28, pp. 1096–1110, 1986 (in Russian).

Chapter 8 'A Classification of Linear Single-Strand Polymers (Recommendations 1988)' *PAC*, Vol. 61, pp. 243–254, 1989.

1. *Kobunshi*, Vol. 40, in press, 1991 (in Japanese).

2. *Vysokomol. Soedin. Ser. A*, Vol. 30, 2608–2617 (1988) (in Russian).

Chapter 9 'Use of Abbreviations for Names of Polymeric Substances (Recommendations 1986)' *PAC*, Vol. 59, pp. 691–693, 1987.

* Reprinted also in a separate booklet: *Définitions de Base en Terminologie des Polymères (1974) et Règles de Nomenclature des Polymères Organiques Monocaténaire Réguliers (Règles approuvées en 1975)*. Hüthig & Wepf Verlag, Basel, 1979 (in French).

** In: Deutscher Zentrallausschuss für Chemie, *Internationale Regeln für die chemische Nomenklatur und Terminologie*, Band 2, Gruppe 3. Verlag Chemie, Weinheim, 1978 (in German).

*** Reprinted also in a separate booklet: *Nomenclature des Copolymères Basée sur le Processus de Formation (Recommendations 1985). Définitions des Termes Physico-Chimiques Relatifs aux Polymères (Recommendations 1988)*. Hüthig & Wepf Verlag, Basel, 1990 (in French).

Compendium of Macromolecular Nomenclature (*The Purple Book*): prepared for publication by W. V. Metanomski, was published by Blackwell Scientific Publications Ltd., Oxford, UK, 1991. xii + 171 pp. ISBN-0-632-02846-7/0-632-02847-5 (pbk). Prices: hardback GBP 28.50/USD 43.00; paperback GBP 11.00/USD 17.50. Affiliate members discount prices: hardback GBP 21.40/USD 32.00; paperback GBP 8.25/USD 13.00.

The address of Dr W. V Metanomski is: Chemical Abstracts Service, PO Box 3012, Columbus, Ohio 43210, USA. Tel: +1 (614) 447 3631. Fax: +1 (614) 447 3713.

Engineering a better world with chemistry

Can we engineer a better world with chemistry? Can chemical engineering contribute to a general increase in our standard of living? Is chemical industry really concerned with human welfare? These were some of the questions addressed at a student European Congress held in The Hague in November last year.

Introduction

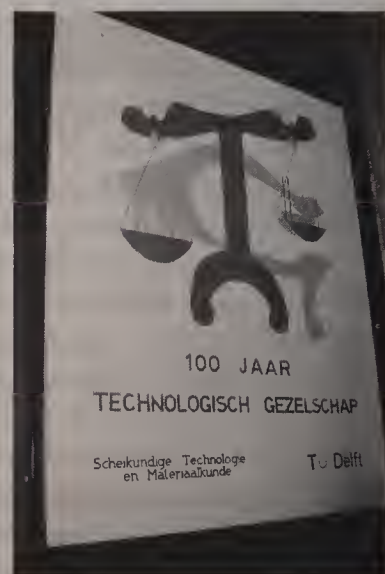
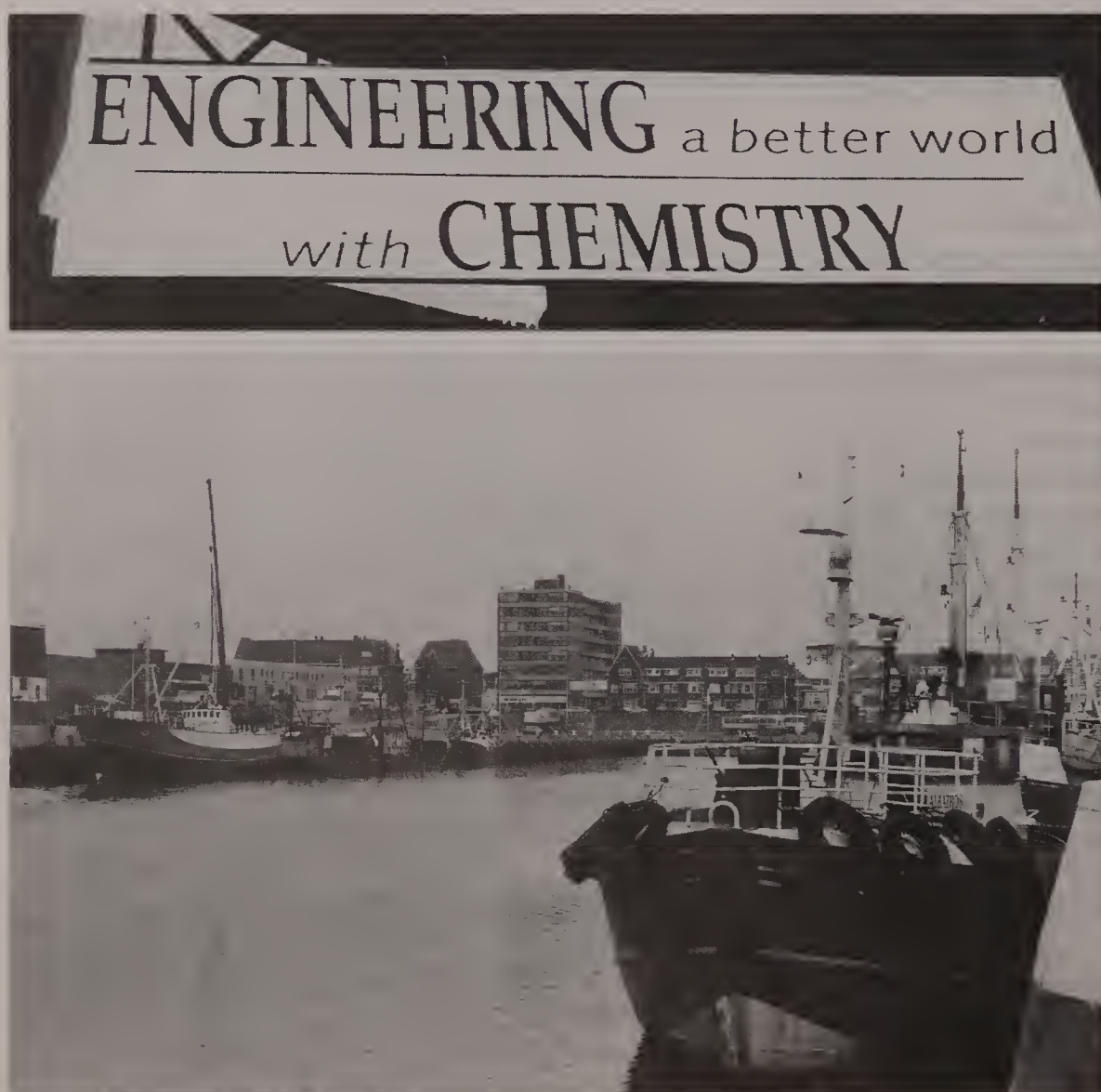
The environment and particularly new cleaner technologies, renewable products and sustainable development were amongst the topics considered at the European Congress on Engineering a Better World with Chemistry. The congress also concentrated on the development of new materials and technologies and political, economic and social factors associated with scientific developments.

The 3-day congress, held at the end of November last year, was organized by students at the Faculty of Chemical Technology and Materials Science of Delft University of Technology in the Netherlands in

order to celebrate the 100th anniversary of Technologisch Gezelschap — the student association of the faculty. The venue was the Netherlands Congress Centre. The Hague. Approximately 1200 students including 480 foreign participants from 28 countries attended the congress.

Environment

Wednesday 21 November — the first day of the congress — was dedicated to the 'Environment.' In the morning, Jonkheer A. A. Loudon, Chairman of the Board of AKSO, presented a plenary lecture in

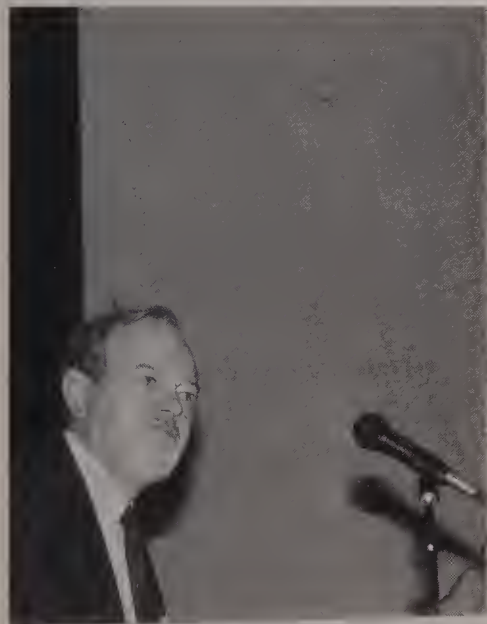


The European Congress on Engineering a Better World with Chemistry, held at Nederlands Congresgebouw, The Hague (top right) celebrated the 100th anniversary of Technologisch Gezelschap, Delft University of Technology.

which he outlined the need for clean processes to attain sustainable development.

Mike Flux (ICI's Environmental Advisor) then lectured on 'Environmental policies with respect to industrial development.' He reminded the audience that we live in a world which is becoming increasingly concerned with the state of our environment and the damage which is being caused by man's activities. Much of that damage has undoubtedly been caused by science-based technology. As a result there are those who blame science for our environmental problems and believe that the solutions are to be found in turning away from technology. He rejected both these conclusions.

Science, he added, is about understanding ourselves and the universe we live in. The possession of knowledge does not of itself result in either good or ill. It is the use to which the knowledge is put that gives rise to any benefits or damage which may arise. It is therefore wrong to blame science. If someone or something must be



Left: Mike Flux presents his lecture on environmental policies.

Below: Plenary lecturer Jonkheer Loudon (left) in discussion with Benno van Dongen who was Chairman of the Congress Committee — Scientific Programme.



blamed it is mankind — for our use of the knowledge we have gained.

Flux suggested that before we reject technology we should consider two facts:

1. Enormous improvements have already been made in reducing the environmental impacts of our technology. Such improvements are likely to continue and could be quite dramatic.
2. The world population rose from 2.5 billion in 1950 to 4 billion in the mid 1980s. It could be 6 billion by the year 2000 and some 10 billion in 100 years time. There is no way we can support the present let alone the future population without modern technology.

'How are we to proceed?' asked Flux. Very useful sign posts were provided by the UN World Commission on Environment and Development (The Bruntland Commission). The commission concluded that environmental protection and economic development are interdependent. We therefore have to strive for 'Sustainable development', which the commission defines as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable development is defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

The challenge for industry is to contribute to more sustainable forms of development by developing new 'cleaner' technologies, by producing the necessary goods from fewer and renewable resources, and by minimizing the environmental effects of existing processes. But it is important to realize that industry will not be able to do all these things by itself. What industry is able to do will ultimately be limited by the demand which exists in society for cleaner goods and society's willingness to pay for goods made from renewable rather than non-renewable resources or by non-polluting processes.

One of the difficulties confronting us is that doing the right thing environmentally does not always make good financial sense. In conventional book-keeping terms, recycling is often uneconomic — it costs more to recycle than it does to make afresh. Nevertheless there are a number of exciting possibilities for environmentally sounder technology which do not appear likely to be commercially viable under current rules.

From left: Roger Sheldon who lectured on clean and versatile technology; Rachel Cox (student participant from Exeter University, UK); and Colette Legein (Congress Organizing Committee — Public Relations, Scientific Programme).



The chemical industry, concluded Flux, has an outstanding history of inventiveness and in improving efficiency; there is little doubt that, given the necessary input of creative scientists, it will be able to do its part in meeting future challenges.

Clean and versatile technology

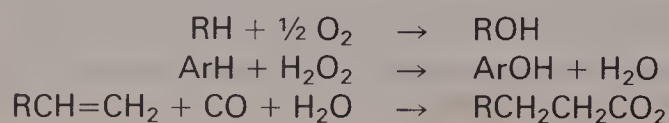
The afternoon of the first day was devoted to four parallel sessions on the following topics:

- clean reactor design;
- risk and safety analysis;
- clean and selective organic processes;
- technology and environmental protection.

The session on 'Clean and selective organic processes' included a lecture on 'Catalytic oxidation: a clean and versatile technology' by Roger Sheldon (R&D Director of Andeno and Professor of Industrial Chemistry at the Technology University of Eindhoven, Netherlands).

Sheldon stated that in recent years the chemical industry is justifiably being subjected to increasingly stringent environmental constraints. This provides a tremendous driving force for the substitution of antiquated, classic organic syntheses by cleaner, more efficient catalytic technologies. Particular emphasis is being placed on reducing the amount of inorganic salts produced (per kg product) as solid or aqueous wastes in chemical processes. Thus, 'integrated waste management' and 'zero emission' plants are commonly heard catch-phrases in the chemical corridors of power nowadays.

Within this context two technologies occupy key positions: catalytic oxidation and catalytic carbonylation. Both offer 'salt free' alternatives to many classic organic syntheses, for example:



The only coproduct in such processes is water. Traditionally, a variety of chemicals have been manufactured via processes involving stoichiometric oxidants, such as dichromate and permanganate. The history of such processes can be traced back to the time of Perkin's synthesis of the first synthetic dye, in 1856, by dichromate oxidation of toluidines. The days of such out-dated, environmentally unfriendly processes are clearly over.

In the bulk chemicals industry traditional environmentally unacceptable processes have long been replaced by cleaner catalytic oxidations. Indeed, catalytic oxidation is the most widely applied technology for the conversion of hydrocarbon feedstocks (olefins, aromatics and alkanes) to commercially important oxygenated derivatives such as ethylene oxide, propylene oxide, terephthalic acid, phenol, acrylonitrile and many more. Both heterogeneous, gas-phase and homogeneous, liquid-phase oxidations are used.

In the fine-chemicals industry, on the other hand, much smaller volumes are involved and there has been less pressure in the past to replace traditional stoichiometric oxidants. However, in today's 'zero-emission' environment it is gradually being appreciated that, although the absolute volumes are significantly less, the number of kilos of by-products are generally much higher. This is partly due to the fact that fine chemicals production often involves multi-step syntheses.

Sheldon reviewed the field of catalytic oxidation within this framework and outlined the various types of oxidation processes on the basis of type of oxidant, mechanism and catalyst. He discussed both homogeneous and heterogeneous systems placing emphasis on selectivity (substrate, chemo-, regio- and stereo-) and synthetic utility. He also emphasized recent developments in, for example, (a) the use of phase transfer catalysis, (b) novel redox zeolites and redox pillared clays as novel heterogeneous catalysts with unique properties and (c) catalytic asymmetric oxidations.



Congress lecturers (from left): Mooson Kwauk; R. Byron Bird; and Sheldon K. Friedlander.

Technology and materials

The second day of the congress was devoted to 'Technology and materials.' The morning session included a plenary lecture on 'Transport phenomena in macromolecular fluids' by R. Byron Bird (Professor of Chemical Engineering at the University of Wisconsin, USA).

Bird said that the subject of transport phenomena is a broad field of importance in many branches of engineering and applied science. That part of the subject that deals with macromolecular systems, however, belongs almost exclusively to chemical engineering. It is particularly relevant as a large percentage of chemical-engineering graduates find employment in the plastics and rubber industries where macromolecular problems are legion.

He then traced the development of the design of polymer flow systems in industry from the 1950s through to the 1980s. According to Bird, throughout all this development there has been a continuing interplay between researchers in industry, who are trying to solve specific design problems, and academic researchers, who are trying to look at some of the long-range problems.

This dialogue between the two groups has provided considerable stimulus to all concerned, and it is evident that considerable progress has been made in the past four decades. As supercomputer technology improves it will be possible to solve many polymer fluid dynamics and polymer kinetic theory problems that have heretofore been too difficult to tackle.

He concluded by saying that the 1990s will undoubtedly see further advances in understanding the mechanical properties of polymer solutions and polymer melts, along with further studies in the thermal and diffusive properties of such systems.

How rare elements entered our living rooms

The afternoon of the second day consisted of parallel sessions on:

- transport phenomena;
- reactor technology
- biotechnology;
- advanced ceramics;
- polymer science.

Why does a true French chef insist on an omelette pan to prepare the perfect omelette, why does the Cantonese cook always choose a wok to prepare the famous snake dish, and why does the Texas multimillionaire insist on his mesquite-burning outdoor barbecue to grill his buffalo steaks? Why? Because these are the right types of *reactors* for these particular purposes — said Octave Levenspiel (Professor of Chemical Engineering at Oregon State University, USA) in his lecture on 'Making friends with chemical reactors' presented in the 'Reactor technology' session.

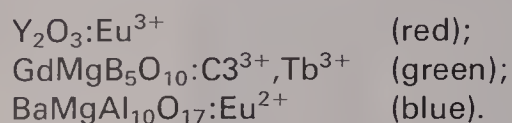
In the same session, Prof. J. F. Davidson (Cambridge University, UK) spoke about 'Fluidization with bubbles' and Prof. Mooson Kwauk (Director Emeritus of the Institute of Chemical Metallurgy at the Academia Sinica in Beijing, China) lectured on 'Fluidization without bubbles'.

The questions of 'How rare elements entered our living rooms' cropped up as a title of a lecture by Prof. G. Blasse (Professor of Solid State Chemistry, University of Utrecht, Netherlands) in the session on 'Advanced Ceramics.' He pointed out that nowadays rare earth elements are not rare at all. These elements are applied in high-technology devices which have entered our living rooms.

To illustrate this Blasse pointed out that there could be no colour television without europium, gadolinium and terbium and no safe X-ray photography in hospitals without europium and terbium. As early as 1955, Klasens and Bril predicted that narrow-line luminescence in the red would be indispensable for high-quality colour TV. Nearly 10 years later it was found that the Eu^{3+} ion shows exactly the required emission. Since then, the production of high-purity rare earths has increased

by several orders of magnitude.

Whereas physicists investigated the details of the narrow-line spectra of rare earth ions, chemists discovered how to vary and control these spectra. This led to the next even more surprising application — energy-saving fluorescent lamps. The new generation of fluorescent lamps use the following luminescent materials:



Rare earths are also used in X-ray phosphors. For example, $\text{Gd}_2\text{O}_2\text{S}:\text{Tb}^{3+}$ and $\text{BaFBr}:\text{Eu}^{2+}$ minimize the amount of X-ray radiation received by the patient.

Molecular information science

The final day of the congress included the following presentations:

- Environmental issues: implications for chemical engineering research and education (Sheldon Friedlander — Parsons Professor of Chemical Engineering and Director of the Engineering Research Center for Hazardous Substances, Control, University of California, Los Angeles, USA).



John Maddox (left) asked 'Is academic research industry's servant or master?' (below): Congress exhibition and poster display.



Nobel Laureates in Chemistry: Linus Pauling (left) who presented a video message at the congress and (right) plenary lecturer Jean-Marie Lehn. (Pauling photo © The Nobel Foundation.)

- Academic research: industry's servant or master (John Maddox — Editor of *Nature*).
- A video message from Linus Pauling (Nobel Chemistry Prize, 1954 and Nobel Peace Prize, 1962).
- Supramolecular chemistry: strategies towards a molecular information science (Prof. Jean-Marie Lehn, Professor au Collège de France, Paris; Nobel Chemistry Prize, 1987).

Lehn explained, in his lecture, that supramolecular chemistry is the chemistry of the intermolecular bond, covering the structures and functions of the entities formed by association of two or more chemical species.

Molecular recognition in the supermolecules formed by receptor–substrate binding rests on the principles of molecular complementarity, as found in spherical and tetrahedral recognition, linear recognition by coreceptors, metalloreceptors, amphiphilic receptors, and anion coordination.

Supramolecular catalysis by receptors bearing reactive groups effects bond cleavage reactions as well as synthetic bond formation via cocatalysis. Lipophilic receptor molecules act as selective carriers for various substrates and make it possible to set up coupled transport processes linked to electron and proton gradients or to light.

Whereas endoreceptors bind substrates in molecular cavities by convergent interactions, exoreceptors rely on interactions between the surfaces of the receptor and the substrate; thus new types of receptors, such as the metallonucleates, may be designed. In combination with polymolecular assemblies, receptors, carriers, and catalysts may lead to molecular and supramolecular devices, defined as structurally organized and functionally integrated chemical systems built on supramolecular architectures.

Lehn analysed their recognition, transfer, and transformation features specifically from the point of view of molecular devices that would operate via photons, electrons, or ions, thus defining fields of molecular photonics, electronics, or ionics.

Science, finance and forward planning: Treasurer's tidings

Anders Björkman

In this article, the Treasurer reviews financial developments and presents predictions for the future of IUPAC. In order to maintain current activities, subscriptions must be raised *and* expenditure decreased by cost-saving rationalization.

Introduction

This short account of the financial problems of IUPAC is intended to contribute to the deliberations required this year to establish a basis for sound and realistic future progress within the Union. In order to explain where we stand, and may go, it is first necessary for me to review developments since 1983 — the year I was elected. In addition, I shall indicate why rational progress is not easy within a large international organization. My review is limited to the big issues: numerous minor problems and achievements, though important, are omitted.



Anders Björkman

Main income items

As Chairman of the Finance Committee for the period 1977–81, I was instrumental in establishing a new scheme for national subscriptions which replaced the traditional category system. The new scheme was based on a 'British exponential formula' — the parameter being national chemical turnovers. It was approved by Council at the Leuven General Assembly (1981), but to be fully operative it had to be amended in Lyngby (1983) and Lund (1989): this is why it is now known as the '4L scheme.'

A major part of the background work on the scheme was the establishment of reliable chemical turnover figures. This was done by my successor as Chairman of the Finance Committee, Fred Wilson, in conjunction with Mo Williams at the Secretariat. By and by, the National Adhering Organizations have been able to produce payments according to the new scheme — with the exception of member countries which have joined recently or suffer from political distress.

In parallel to the stabilization of the subscriptions (which are the main source of income for IUPAC), it has been possible by different measures to raise income from assets (interest and dividends, capital gains realized, and publications). This has, of course, improved the financial basis of IUPAC activities, but it did mean that the accounts for several years showed excesses of income over expenses in the order of USD 200 000.

With the traditional budget preparation, this favourable effect made it politically impossible to raise total subscriptions materially over 6 years from 1984 to 1989. As a result we are now faced with the dilemma outlined below.

Budget preparation

My next endeavour was to change the budgeting to a procedure which tallies with the statutory responsibilities of the Treasurer. Traditionally, the budget was largely concerned with the question of raising national subscriptions, but often without firm foundation. Thus, a budget was approved early in the biennial Council meeting, and the allocations of money to IUPAC bodies took place afterwards.

In the new budget procedure, the division/section presidents, chairmen of standing committees and Secretariat present budget requests a good half year before a general assembly. During the half year, the Treasurer works on the budget, discussing in the Finance Committee the financial position of IUPAC and future projections, and also preparing a first pre-allocation of money to IUPAC bodies. This pre-allocation is made by the IUPAC officers immediately before the Spring meeting of the Executive Committee. This committee then approves a tentative budget.



Bureau meeting in Milan, September 1991. The final IUPAC budget proposal is presented to Bureau before approval by Council.

The pre-allocation to bodies is adjusted by the officers at the general assembly, and the final IUPAC budget proposal is presented to Bureau and approved by Council, possibly after amendments. This approval takes place towards the end of the Council meeting. Finally, the Treasurer, in consultation with the division/section presidents and the chairmen of standing committees, works out a final allocation. This requires the approval of his fellow officers by December 1st in the year before the new biennium.

The principal advantages of the new budget procedure are the more thorough preparation of basic figures and the presentation of plans and all available financial information *before* Council approves the budget.

The two first rounds of the new procedure have worked out fairly well, although the first was probationary and the second suffered from unexpected communication problems. It is evident, looking at the accounts for 1988 to 1990, that the outcome (total expenditure compared to income) is fairly close to the budget figures, except for 1989 when the budgetary provision for the Lund General Assembly was set too high.

'None-core' developments

The allocations, discussed so far, concern mainly funds which go to the so-called core activities. However, two items make the financial picture more complicated, namely CHEMRAWN (CHEMical Research Applied to World Needs), established in 1976, and the 'horizontal' mission-orientated programmes, which emerged from discussions of IUPAC restructuring and led to the start of definite action at the Lund General Assembly in 1989.

The CHEMRAWN Committee and its conferences will not be discussed in detail in this article, despite the fact that discussions about the IUPAC liability on these conferences and the maintenance of the CHEMRAWN rolling fund has called on a substantial part of the workload of the Treasurer.



Meeting of the Coordinating Committee on Chemistry and Advanced Materials Programme in Milan 1991. The financial feasibility of conducting such programmes is presently under intense consideration.

The mission-orientated programmes appear to be a bigger headache. Two 'horizontal' programmes were proposed in Lund. The first and major one (so far) was the 'Chemistry and the Environment Programme' (CEP), headed by Valentin Koptug. The difficulty was that the financial decisions had to be taken at a very late stage during the assembly. The only possibility to balance the budget reasonably was to use some assets separately for the 'horizontal' programmes. This was allowable since assets were (and still are) in a favourable state.

The second subject, 'Chemistry and Advanced Materials Programme' (CAMP), headed by Past-President C. N. R. 'Ram' Rao, is also now on its way. The financial feasibility of conducting such programmes is presently under intense consideration and final decisions must be taken this year at the Hamburg general assembly. Since the decisions were taken somewhat *ad hoc* in Lund, a conflict between *core* and '*horizontal*' projects has emerged. The reason is obviously the financial limitations, and this discord constitutes a main item in this presentation of IUPAC finances.

Financial considerations

A major issue at Lund in 1989 was an analysis of cost items, presented by Fred Wilson. It was observed, somewhat strikingly, that the extended period of practically unchanged total national subscriptions (1984–89) resulted in a decrease in the contribution of subscriptions to total income from about 80% to 55%. In view of this and also the large excess of expenditure over income in the biennial budget, Council approved a 10% increase in total subscriptions in 1990 and 1991.

The analysis by Wilson has been carried forward and extended by his successor in the Finance Committee, John Ward. The latter will present his results in his report to Council at Hamburg, and I shall not attempt here to summarize them. However, I may infer that his observations clearly indicate that a further increase in subscriptions is needed if IUPAC wishes to maintain or possibly increase its activities along the lines discussed below.

Instead, I would now like to present some calculations, using a *forward-planning* method suggested by a member of the Finance Committee, Josef Brunner, who is very experienced in such matters. The idea is to present plans (or scenarios) based on simplifying assumptions with regard to minor income and expenditure items. Another basic and conceivably very realistic supposition is to state that the increase of income from assets and publications in previous years has had the character of a windfall. This income is, of course, still very important, but it can hardly continue to produce a substantial increase in income.



Fred Wilson
analysed cost
items.

With these assumptions and without going into further detail, I propose to tabulate four possible 5-year scenarios (starting with 1991) that illustrate the expected forward financial developments. These make certain predictions but retain postulatory policies applied to estimated expenditure. The four scenarios or plans are:

1. Normal activities — subscriptions remain unchanged.
2. Normal activities — subscriptions are increased 10% *per anum*.
3. Normal activities — subscriptions calculated to result in no excess of expenditure over income.
4. As in Plan 2 but USD 80 000 are added for new activities in 1992 and 1994.

The resulting figures (in units of USD 1000) are as follows (note that odd-numbered years are general assembly years):

PLAN 1

	Year				
	91	92	93	94	95
Expenses					
Office	307	340	375	414	455
Bodies	630	520	600	625	720
Other	60	60	60	60	60
Total	997	920	1035	1099	1235
Income					
Subscr.	504	504	504	504	504
Assets/publ.	273	280	280	280	280
Other	36	36	36	36	36
Total	813	820	820	820	820
Excess of income	-184	-100	-215	-279	-415
Total	-1193				

PLAN 2

	Year				
	91	92	93	94	95
Expenses					
Office	307	340	375	414	455
Bodies	630	520	600	625	720
Other	60	60	60	60	60
Total	997	920	1035	1099	1235
Income					
Subscr.	504	555	610	672	740
Assets/publ.	273	280	280	280	280
Other	36	36	36	36	36
Total	813	871	926	988	1056
Excess of income	-184	-49	-109	-111	-179
Total	-632				

PLAN 3

	Year				
	91	92	93	94	95
Expenses					
Office	307	340	375	414	455
Bodies	630	520	600	625	720
Other	60	60	60	60	60
Total	997	920	1035	1099	1235
Income					
Subscr.	688	604	719	783	919
Assets/publ.	273	280	280	280	280
Other	36	36	36	36	36
Total	997	920	1035	1099	1235
Excess of income	0	0	0	0	0
Total	0				

PLAN 4

	Year				
	91	92	93	94	95
Expenses					
Office	307	340	375	414	455
Bodies	630	600	600	705	720
Other	60	60	60	60	60
Total	997	1000	1035	1179	1235
Income					
Subscr.	504	555	610	672	740
Assets/publ.	273	280	280	280	280
Other	36	36	36	36	36
Total	813	871	926	988	1056
Excess of income	-184	-129	-109	-191	-179
Total	-792				

It may be stated that the maximum amount of assets available to take care of such deficits is of the order of USD 500 000.

Cost saving

These tables show that subscriptions were left at a low level too long. This was only possible because of the windfalls from other income. Moreover, 10% yearly increases in subscriptions are not enough to solve the lack of balance. Thus, we have now to pay for deficient forward planning in previous years.

In principle, if Council wishes to carry out all desired activities, it cannot be accomplished by just raising subscriptions, as the increases are utterly unrealistic. Due to the current world-wide economic situation and the competition for funds in other scientific areas, we can only count on moderate increases in subscriptions.



Council voting at the Lund general assembly. In principle, if Council wishes to carry out all desired activities, it cannot be accomplished by just raising subscriptions, as increases are utterly unrealistic.

The clear consequence is that IUPAC must reduce expenditure. It is not for me to dictate a solution to this problem. I can only point to technically possible ways of cost reduction with the occasional comment when I feel that my experience is of interest.

As many of us know, titular members of IUPAC are entitled to receive contributions towards travel and subsistence from IUPAC funds. These payments remain at moderate levels and many titular members receive only partial expenses, or none at all when they have other sources to draw one — for example, when their meeting is linked to an international conference of national interest to titular members. Participation of industrialists frequently falls into this category. Furthermore, administration expenses in connection with IUPAC activities of titular members are often covered by their employers. This is because IUPAC activities are considered equal to other professional activities for which a titular member can expect to receive support whilst 'at home'. Indeed, the non-budget income which arises from these voluntary contributions is considerable.

Voluntary contributions have evolved historically and have attained different forms of 'equilibrium'. Some may consider that IUPAC should attempt to give less support and thereby hope for an increase

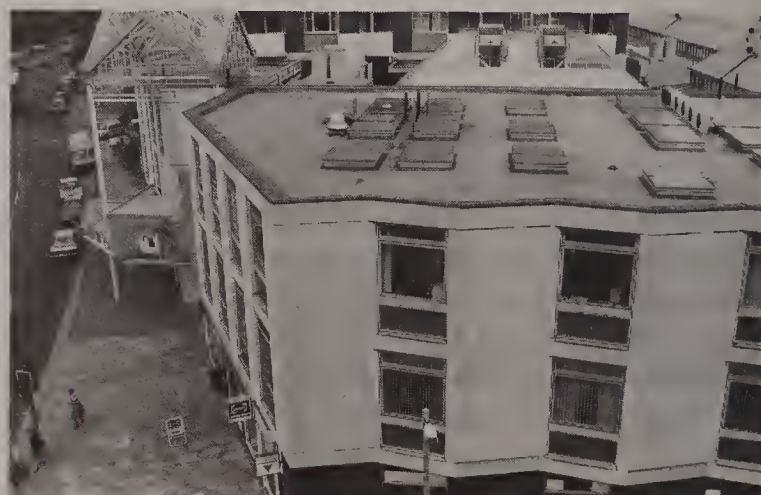
in voluntary contributions. However, I wish to issue a warning. The trend is for IUPAC members to depend less on this type of support.

One method of reducing costs is for chairmen of IUPAC bodies to find less-expensive venues for their meetings. This may require some kind of 'disciplinary' action.

Another possibility would be to reduce the number of titular members. This has been done before. In my opinion we should reconsider the concept of titular members. In my time as Treasurer I have been rather flexible in providing funds to non-titular members when the reason for it is evident and strong. One possibility, suggested by a prominent division president, would be to have in a body very few titular members and to call on experts to give advice and to advance developments. Presumably, many titular members in spite of high standing, do not generally contribute significantly. Thus, IUPAC would need to turn from a rather static to a more dynamic organization. The proposal by IUPAC President Yves Jeannin to have Limited Life Time Commissions (LLTCs) was something of this nature, but it has not been instituted as part of the budget.

Still another possibility, which will be discussed seriously by the Executive Committee and then taken to Council in Hamburg, is the amalgamation of commissions which are closely related. This is *not* a matter of reduced activities, but a rationalization. This measure is primarily related to the important core activities. However, the matter may have to be linked to considerations of LLTCs and 'horizontal' programme.

It should be noted that any move to analyse previous years or to do forward planning is obscured by the change in the USD exchange rates, particularly with regard to the cost (in USD) of the Secretariat in Oxford. This is one reason why it is good and necessary to maintain a sufficient level of assets.



Secretariat in Oxford: any move to analyse previous years or to do forward planning is obscured by the change in the USD exchange rates, particularly with regard to the cost (in USD) of the Secretariat.

Final comment

Oddly, due to previous inferior planning, IUPAC is now lucky enough to have a comfortably high level of assets. This is indeed a necessary condition if we wish to raise subscriptions at a realistic pace and have time to accomplish cost-saving procedures. It is hardly possible technically to implement cost savings right away. Consequently, the extra 'cost load' over an interim period — possibly a biennium — has to be covered from assets.

Still, it is an absolute requisite that the cost-saving measures are determined at the Hamburg General Assembly — especially if they necessitate a reduction in IUPAC activities. If this is not achieved, the budgets for 1992 and 1993 cannot be made to balance as such. The delay in cost-savings will be part of the financial planning and the 'extra costs' (to be paid from assets) will have to be identified and approved as part of the plan. This will be the only rational possibility of designing a forward plan which will render possible the sound maintenance and advancement of IUPAC activities.

I would like to end with an observation in regard to the role of the Treasurer. If the financial resources

of IUPAC are to be used optimally to benefit the progress of chemistry, the Treasurer has to be a chemist with a thorough understanding of IUPAC activities. Once financial matters are analysed and plans formulated, common sense is a sufficient requirement of a Treasurer. The financial expertise is made available by having a professional Finance Committee which should, however, have at least one member, who is fully familiar with the scientific activities of IUPAC.

IUPAC policy for software and data form

When the Bureau met at Triuggio, Milan in September 1990, it approved Prof. Jeannin's recommendation that IUPAC should officially adopt the policy of the Committee on Chemical Databases (CCDB) to have dBASE III as the retrieval software and the data in ASCII format. This will make the IUPAC database projects economical and the data easily transferable to other computers.

Conservation of monumental buildings

Franco Piacenti

During the Federation of European Chemical Societies (FECS) General Assembly, held in Frankfurt, Germany, June 1990, Franco Piacenti presented a lecture on chemistry for the conservation of monumental buildings. The following is the text of his lecture.



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Introduction

Cultural heritage in general and monumental buildings in particular have received much attention not only because of their cultural importance but also because they represent an economic resource

that promotes tourism. Indeed, it has been realized that investments in the conservation of cultural heritage provide a return both in cultural and economic terms.

Until a few years ago, the conservation of monumental buildings was accomplished by highly skilled artisans, sometimes even artists, with a training adequate to perform their work according to traditional procedures. Such procedures involved substitution of the more deteriorated stones, cleaning, and protection, by the use of natural products, from what we may now call natural ageing.

The deterioration of monumental buildings, however, has accelerated greatly in recent decades due to the effect of atmospheric pollutants. More efficient products and procedures are therefore necessary to tackle this problem.

Chemistry has a fundamental role to play in the understanding of the causes and mechanisms of deterioration of stone and the development of procedures and products for its conservation.



Chemistry has a fundamental role to play in understanding the causes and mechanisms of stone deterioration and the development of procedures and products for conservation.

The role of chemistry

The role of chemistry in the conservation of monumental buildings has always been underestimated. Its contribution has therefore been insufficient and this state of affairs has, in some cases, had unhappy results.

A strong impulse to involve chemists and to apply chemical knowledge in the field of conservation came from the need to solve exceptional problems created by the floods in Venice and Florence in 1966. When the water withdrew, it was realized how limited was the knowledge and understanding in chemical terms of the processes of deterioration that had to be faced, and the properties required of the products to be used in conservation procedures.

Funds were subsequently provided to develop research in this field. Research laboratories, especially in chemical institutes, started investigations to understand the causes and mechanism of deterioration, to develop techniques appropriate for measuring the state of deterioration of stone and finally to devise and develop materials and procedures for its consolidation and protection.

Stone deterioration

The stones used in monumental buildings that rapidly deteriorate are often sedimentary stones, sandstones, with a calcareous or clay matrix or, alternatively, limestone.

The deterioration process of stones exposed to the open atmosphere is caused mainly by dissolution of the binding medium. Rain water, even in unpolluted areas, causes a slow but effective dissolution of calcium carbonate over long periods of time, especially in combination with carbon dioxide, which is always present in the atmosphere, due to the higher solubility of calcium hydrogen-carbonate.

Rain water slowly dissolves not only calcium carbonate but also the clay binding medium through hydrolysis which causes loss of potassium and magnesium ions. These phenomena, which take place even in uncontaminated districts, are greatly accelerated in the presence of atmospheric pollutants of an acidic nature such as sulfur dioxide, sulfuric acid, nitrogen oxides and carbon dioxide.

Rain, when falling, collects the pollutants, concentrates them, and brings them into contact with the surface of the exposed stone. The pH of rain, which at the beginning of each event may be as low as 4, increases rapidly almost reaching neutrality within a few minutes. These pollutants act both as reagents in dissolution reactions and as catalysts in hydrolytic reactions.

The dissolution of the binding medium increases the porosity of the stone and the decohesion of the aggregate. In the pores, water may be occluded which freezes when the temperature falls below 0°C, causing strong pressures on the walls of the pores and eventually the collapse of the stone structure.

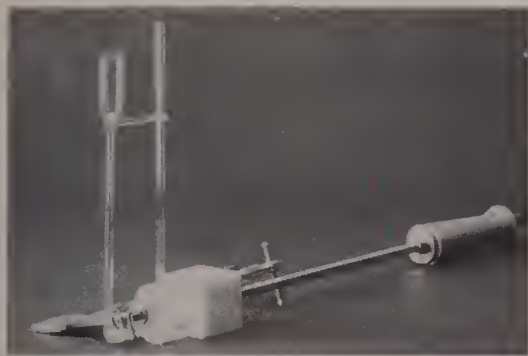
These, then, are the main causes and processes of the decay of stone. It follows that the protection of monumental buildings may be enhanced by procedures that prevent or greatly reduce contact with and penetration of rain into the stone.

Measurement of decay

In order to study the evolution of stone decay and to evaluate the efficiency of the conservation treatments devised, it is necessary to identify parameters indicative of the state of decay which may easily be measured and which give objective evaluations.

The following procedures were developed by research teams to measure the decay of a deteriorated sample of stone with reference to sound samples:

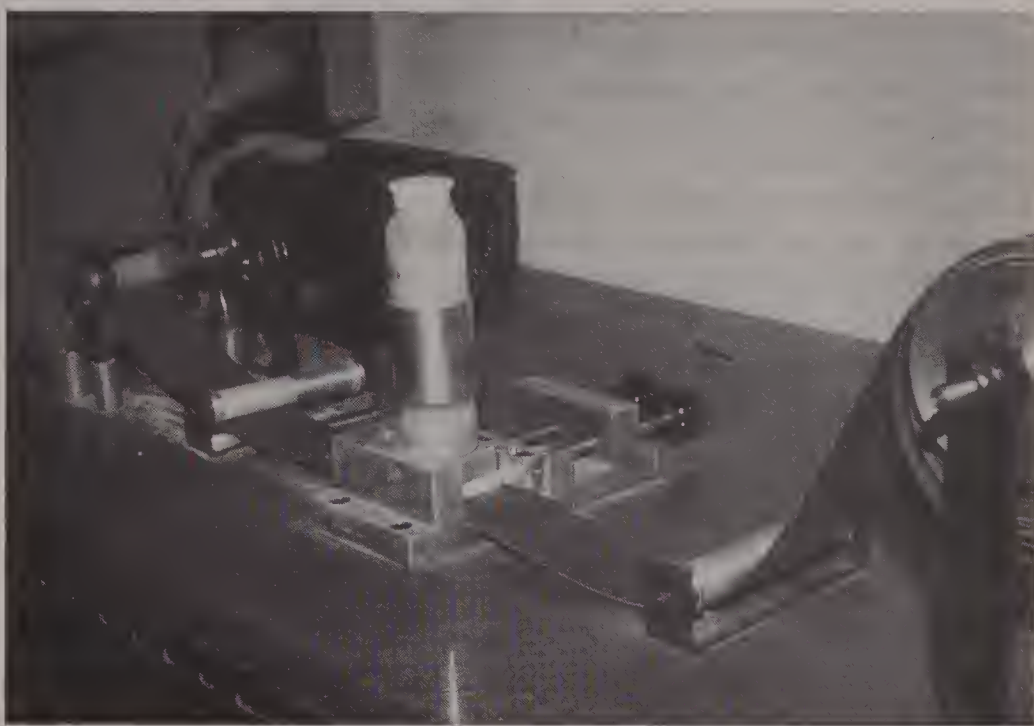
- rate of absorption of water;
- rate of progress of the humidity front inside a sample; and
- degree of disaggregation of the material on a surface by abrasion.



Apparatus used for the determination of the rate of absorption of water.



Determination of the rate of progress of the humidity front inside a sample of marble by a sensor introduced in a cavity.



Device used to determine stone aggregation by measuring the loss of material caused by abrasion under reproducible conditions.

All the parameters mentioned above are strictly related to the porosity of the stone and are therefore indicative of its state of conservation.

Another parameter of great relevance, especially when considering the behaviour of superficial treatments, is the permeability of the stone to water vapour. Such a parameter may be measured by the use of a simple device which makes it possible to measure the loss of water through a sample of stone of a given thickness.

Another determination, which is essential in this sort of research, concerns the behaviour of stone and the treatment of ageing. In order to reduce testing times, accelerated ageing chambers may be used where cyclical changes in temperature and humidity may be realized according to a desired programme and where even pollutants may be introduced.

Conservation of stone

The conservation of stone involves three main operations:

- cleaning;
- consolidation;
- protection.

The first stage, cleaning, is the best known and most well developed. Black crusts, due to deposi-

tion of dust, soot and salts, must be removed without damaging the stone below.

Normal cleaning procedures involve spraying with deionized water and application of packs of wood pulp and/or sepiolite soaked in solutions of ethylenediaminetetracetic acid or ammonium carbonate. Mild mechanical cleaning procedures may also be used.

Consolidation of disaggregated stone and its subsequent protection are operations requiring strong chemical support in terms of development of appropriate materials.

The consolidation of stone is a problem which has been tackled using treatments which aim to restore, as far as possible, the original mechanical properties of the stone. The validity of these treatments is measured by determining the hardness of the surface.

The products used to achieve this effect have been quite different: acrylic polymers, silanes, silicic esters and epoxy resins. They have been used on different substrates, in different situations, providing fair performances for periods of up to a few years.

In general, the durability of these products is unsatisfactory when compared with the expected life of monumental buildings. Other problems arising are colour changes, fragility in thin layers, and low permeability to water vapour.

The difficulty of identifying appropriate products for this use is connected with the need to have, at the same time, such properties as hardness, great durability, chemical stability and the possibility of being applied to the stone in fluid form. Other products with improved properties could probably be imagined and synthesized after a more searching consideration of their expected role on the stone.

It has recently been established that the real role of these products is to aggregate loose materials in order to prevent their loss. With this new aim in mind, different new products could probably be considered as candidates for aggregation procedures.

Restoration laboratories and institutes need products for application to the surfaces of monumental buildings. These products should have aggregating and/or protective properties and should fulfil the requirements mentioned above. Our laboratory therefore decided to work on the development of a product to be used in the protection of stone. We thought that this goal could be achieved more rapidly than the synthesis of a product for consolidations.

Products to be used as protective agents on stone should have the following properties:

- chemical stability and unreactivity towards the stone;
- low volatility;
- transparency and lack of colour;
- insolubility in water and most organic solvents;
- permeability to water vapour;
- stability to atmospheric agents, heat;
- ability to reverse treatment.

The product must, of course, prevent or greatly reduce the access of rain in the stone because rain, as indicated above, is the main cause of decay.

Chemical stability is essential from many points of view, such as retention of the properties for long periods of time and the ability to provide reversibility of treatment and to leave the stone unharmed. Low volatility is necessary to avoid loss of the agent.

The permeability of the surface to water vapour is essential to avoid retention of liquid water resulting from condensation of the humidity present in the stone under the treated surface. Accumulated water may dissolve the stone ligand and cause formation of a loose crust which eventually falls.

Use of fluoropolymers

The need for chemical stability led us to consider perfluorinated organic polymers as protective agents. The relatively high bond energy of the C–F bond compared to the bond energies of the C–H, C–O and C–C bonds appeared a safe indication of stability and low reactivity of these products.

Perfluoropolyethers were preferred to perfluorinated hydrocarbons as possible candidates for this use since they exhibit extreme stability, absence of colour, permeability to oxygen and insolubility in water and most organic solvents. They are also liquid and may therefore be applied easily to a solid surface. Other properties (see Table 1) include non-toxicity, low superficial tension and a refractive index with a value near that of water.

Table 1. Physico-chemical characteristics of the perfluoropolyethers

Appearance	Colourless transparent liquid
Kinematic viscosity at 20°C/mm ² s ⁻¹	950–1050
Specific weight at 20°C/g cm ⁻³)	1.90
Pour point	–35
Refractive index /n _D ²⁰	1.30
Volatility after 22h at 150°C/% weight loss	4
Solubility	Insoluble in water and in most organic solvents except chlorofluorocarbons
Ignition point	Non-inflammable
Toxicity	Non-toxic

In fact there are various versions of these perfluoropolyethers. For example, Krytox (see Fig. 1) is made by Du Pont from hexafluoropropene oxide and is a very regular branched polymer. Demnum is produced in Japan from tetrafluoro-oxopropane and is a completely linear product while the one we have been using in our experiments is produced by Montefluos in Italy by photo-oxidation of hexafluoropropene.

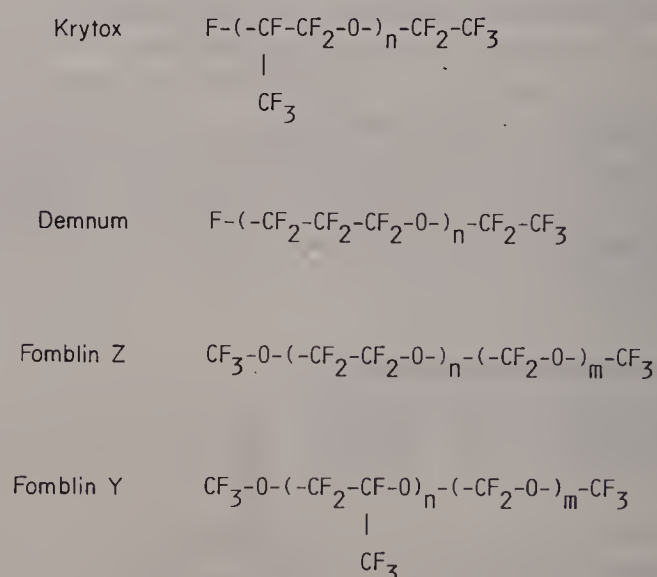


Figure 1. Molecular structures of perfluoropolyethers from different sources.

Tests

Tests of the performance offered by this last product as protective agent were performed on samples of Carrara marble and pietra serena, a sandstone with a clay matrix, the first with a porosity of 0.5% and the second with 5% porosity. The amount of product applied was 50 g m^{-2} on marble and 150 g m^{-2} on the sandstone.

The efficiency of the treatment was evaluated by determining the rate of absorption of water against time for treated and untreated samples. In the case of marble (see Fig. 2), the treatment provides a high protection which may be evaluated as 96%, while the reduction of water penetration in the sandstone is about 80%. By applying the appropriate amount of the protective agent, the efficiency desired may be reached in both cases.

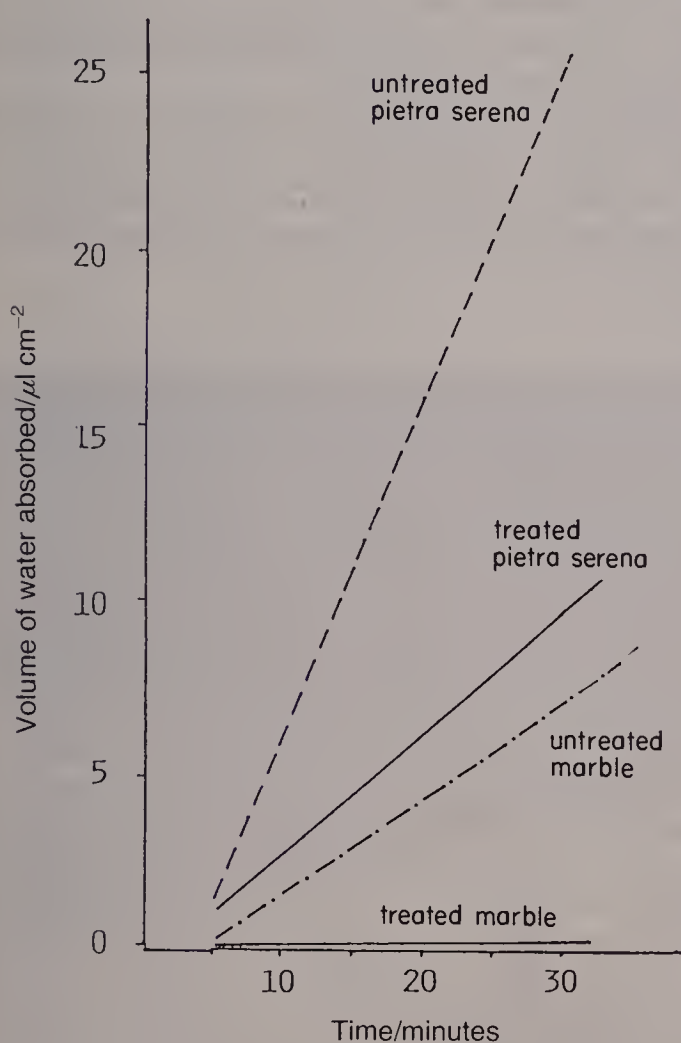


Figure 2. Volume of water absorbed by marble and pietra serena samples treated with perfluoropolyether.

Stability tests performed on treated samples by exposure to polluted atmosphere under UV irradiation at temperatures up to 100°C confirmed the complete stability of these products even after months. Tests performed in accelerated ageing chamber using 7-hour cycles and temperature changes from -8°C to $+45^{\circ}\text{C}$ and humidity changes

from 45 to 95% after 700 cycles confirmed the stability of the products and the efficiency of the treatment. The small increase in water absorption noticed in both marble and sandstone samples could be attributed to an increase of porosity due to thermal changes which could not be prevented by the treatment.

Tests to measure the permeability of the surface to water vapour by determining the rate of loss of humidity of the treated sample have shown that this product does not affect this parameter.

This product proved to be effective and to possess all the characteristics required. At first it was applied to less-important monuments and then, later, on a larger scale to those of greater importance.



Under-porch of Lucca Cathedral protected with perfluoropolyethers (Fomblin YR) in 1982.

Large-scale use

The first large-scale use of the product occurred at the beginning of the 1980s on the under-porch of the Cathedral in Lucca. After more than eight years the performance of this product still gives no signs of decline.

A thorough investigation of the behaviour of the perfluoropolyether on the surface after long standing has shown that this liquid, which is very mobile, tends to penetrate deeply into the stone (marble) and therefore the amount of product present on the outer surface which has to be protected tends to decrease.

This mobility occurs because this product is stable and remains liquid while its ethereal oxygens, which are the only points which might fix it to the stone, have a low ethereal coordinating character due to the electronegativity of the fluorine in the molecule. In order to overcome this difficulty we thought of improving the interaction, by van der Waals forces, between the stone and the perfluoropolyetheral molecule and therefore decreasing its mobility by introducing a polar functional group.

We were able to obtain monocarboxylic derivatives of these perfluoropolyethers, which are

intermediates in the synthetic process. We converted these acids to their sec-butyl esters and amides and tested these new products in the same way described for the basic polyethers.

The stability tests convinced us to discard the esters since they hydrolysed fairly easily once applied to the stone. The amide on the other hand proved to be stable even after several months of exposure to high humidity in thin layers on samples of our stones. Stability to heating up to 70°C and UV irradiation was very satisfactory.

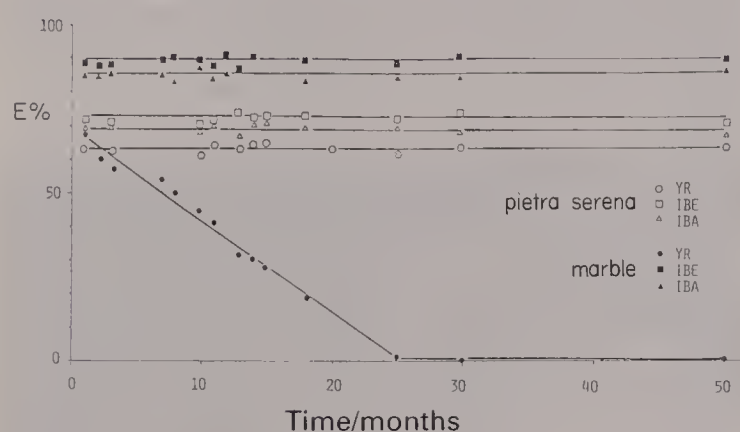


Figure 3. Protection efficiency (E%) of protective treatments on ageing. (YR = perfluoropolyether: basic product; IBA = perfluoropolyether sec-butyl amide; IBE = perfluoropolyether sec-butyl ester.)

We then tested the performance of these new products on both marble and the sandstone pietra serena. As can be seen from Fig. 3, there is a considerable improvement in the stability of the treatment efficiency through a period of more than 50 months on marble. On marble, a fairly rapid decrease of efficiency occurs when the protective agent is the original perfluoropolyether, while the behaviour is much improved when a functional group is inserted in the molecule as an ester or amide.

A research programme for further improvement of the performance of these products, especially on stones of very high porosity — in the region of 30–40% — on which the previous products do not give satisfactory results, has been set up in our Research Center at the University of Florence and supported by Fondazione San Paolo di Torino and by P. F. Chimica Fine II.

Diamides of the same carboxylic acids with ethylenediamine and hexamethylenediamine have been synthesized and even higher polymers of this type are in the programme.

The first results obtained show that the working hypothesis of improving performance by increasing the number of polar groups in the molecule is correct and that better results are provided by these diamides.



Prato Cathedral was treated with perfluoropolyethers in 1986.

Pure and Applied Chemistry (PAC) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Solubility phenomena

Plenary and specially invited lectures presented at the 4th International Symposium on Solubility Phenomena held in Troy, USA, 13 August 1990 appeared in the November 1990 issue of *PAC*.

The proceedings include a paper by Sten Åhrland (University of Lund, Sweden) entitled 'Complex equilibria, solvation and solubility.' The paper points out that for metal salts involved in complex formation the overall solubility is a complicated function of the solvation and stabilities of the various species present. This treatise discusses how these factors, and hence the solubilities, vary between different complex systems and different solvents. Åhrland uses the copper(I), silver(I) and mercury(II) halide systems to provide examples. Their behaviour in the solvents water, dimethyl sulfoxide, acetonitrile and pyridine is the main subject of this study.

Roberto Fernández Prini (Universidad de Buenos Aires, Argentina) presented a paper on 'Influence of thermodynamic variables and molecular parameters in the solubility of gases in liquids.' In the published paper, Prini indicates that a semi-empirical procedure based on measurements of solubility over a reduced temperature range and the use of a perturbation method with a hard-sphere reference fluid, is able to describe satisfactorily the thermodynamics of dissolution of non-polar gases in water over all the temperature range and for gas pressures up to 50 MPa.

The procedure can also be applied to systems constituted by anisotropic molecules, either spherically approximating the intermolecular potential or employing the interaction site model. Prini explores the possibility of extending these ideas to deal with the dissolution of gases exhibiting larger intermolecular interactions with the solvent.

Angela Danil de Namor (University of Surrey, UK and Associate Member of the IUPAC Commission on Solubility Data) delivered a lecture on 'Thermodynamics of host-guest interactions: solubility enhancements' at the Troy meeting. Danil de Namor points out in her paper that one of the most important properties of synthetic macrocyclic hosts such as cryptands is their ability to interact with metal cation guests. She therefore summarizes the thermodynamics of cation-cryptand complexation reactions in different media.

She follows this with a report of recent thermodynamic studies aiming to investigate the host properties of synthetic (crown ethers and cryptands) and natural (cyclodextrins) macrocyclic hosts towards substrates of biological relevance. Danil de Namor demonstrates the importance of transfer data for the host and guest components of the system among different reaction media in the interpretation of complexation processes involving macrocyclic hosts. She then shows the effect of macrocyclic ligands on the solubility of amino acids in non-aqueous media.

A century of solution chemistry

The December 1990 issue of *PAC* contains the texts of most of the plenary lectures presented at the 21st International Conference on Solution Chemistry held in Ottawa, Canada on 5–10 August 1990.

The conference organizing committee, chaired by IUPAC affiliate Christian Detellier (University of Ottawa, Canada) invited Prof. Keith Laidler (also University of Ottawa) to give a special introductory lecture on the field of solution chemistry, from a historical perspective.

His lecture, published in this issue of *PAC*, is entitled 'A century of solution chemistry.' He writes in the introduction that the first Nobel prize in chemistry, awarded to van't Hoff, was partly for his work in solution chemistry. His great success in chemistry was due to his imaginative approach to problems and to his genius for combining experimental and theoretical studies in the most effective manner.

In August 1890, N. A. Menachutkin published an important study on solvent effects on reaction rates, and the considerable extensions of this type of investigation, carried out over many decades, have greatly enriched our understanding of solution chemistry. Over the last century our ideas have been revolutionized by the quantum theory and quantum mechanics. Even more important has been the

development of new experimental techniques, such as relaxation methods, nuclear magnetic resonance, ultrasonics, and flash photolysis, allowing us to explore the fastest of physical and chemical processes, such as those occurring in solutions.

In his preface to the conference papers published in this issue of *PAC*, Detellier points out that traditionally one of the major objectives of chemistry has been to rationalize atomic organization within molecules. During more recent years there has been a blooming of interest in rationalizing supra-molecular organization, involving an expansion from the intramolecular level of covalent bond organization to the intermolecular level of non-covalent bond organization.

For many years the solution chemist has been concerned with supramolecular organizational problems, e.g. by studying the molecular structure of solvents and the solvent's microstructure round a solute. Two of the papers at the conference were concerned with supercritical fluids and the analytical chemistry of natural waters. Many of the lectures were concerned with the molecular organization of solutions, borrowing their subject material from the traditional fields of organic, inorganic and physical chemistry.

Topics covered were thermodynamics and Monte Carlo simulations of the role of the solvent in host-

guest recognition processes; the kinetics and mechanisms of cationic complexation by multidentate and macrocyclic complexes; fast reactions dynamics and solvent motions in electron-transfer processes; dielectric relaxation and X-ray observation; and studies of electrolyte solutions. Also included were fascinating problems raised by organic and biological chemists who take advantage of unusual synthetic properties of enzymes in non-aqueous solvents.

IUPAC affiliate Toshio Yamaguchi (Fukuoka University, Japan) gave a lecture on 'Diffraction and X-ray absorption studies of electrolyte solutions.' He reported that microscopic structures of electrolyte solutions over a wide range of concentrations have been determined by three different techniques: X-ray diffraction, neutron diffraction combined with isotopic and isomorphic substitution, and X-ray absorption methods.

Yamaguchi briefly described advantages and limitations in structural information obtained by the three methods. He explained that structures of some ionic solutions in room temperature liquid, under-cooled, and glassy states have been revealed from comparative X-ray and neutron diffraction and X-ray absorption measurements. He also discussed the relationships of physico-chemical data of the solutions to microscopic structures of the solutions.

Recent Report

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Terminology in semiconductor electrochemistry and photoelectrochemical energy conversion (Recommendations 1991)

In this document recommendations for the usage of symbols and terminology in semiconductor electrochemistry are given. Such a supplement to conventional electrochemical usage is necessary because of the additional terminology based on solid-state physics and chemistry. Because different symbols are conventionally used in electrochemistry and semiconductor physics for the same quantities, one has had to compromise with symbols in the present document which differ from those originally recommended by the Commission on Electrochemistry.

In the present document energy levels in the bulk of the solid and the electrolyte including their interface are introduced and kinetic parameters defined. In addition a terminology on photoelectrochemical cells is recommended. In the latter case, it is distinguished between two modes of operation in these cells, i.e. photovoltaic cells in which radiant energy is converted into electrical energy and photoelectrolysis cells in which radiant chemistry causes a net chemical conversion.

This report was prepared for publication by A. J. Bard, R. Memming and B. Miller, Commission on Electrochemistry (Physical Chemistry Division) and published in PAC, Vol. 63, No. 4, pp. 569–596, 1991.

A synopsis of the report was published as Provisional Recommendations in CI, Vol. 11, No. 2, p. 68, 1989. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of October 1989 were taken into consideration when preparing the final report.

ICSU General Assembly 1990

IUPAC Secretary General Tom West reports on the 1990 ICSU General Assembly which took place in Sofia, Bulgaria, in October last year.

Introduction

The International Council of Scientific Unions (ICSU) held its biennial General Assembly in Sofia, Bulgaria from 1 to 6 October 1990. I attended the meeting as IUPAC's representative and also that of the ICSU Inter-Union Commission on the Application of Science to Agriculture, Fisheries and Aquaculture (CASAFA) which was held in Sofia immediately before.

Most of the topics discussed at both these meetings were of interest to IUPAC and chemists in general. However, I only have space for a brief account of a limited range of those topics particularly relevant to our Union. Before doing so, however, it would perhaps be useful to write a few words about the objectives and organization of ICSU.



The National Palace of Culture, Sofia, was the venue of the 1990 ICSU General Assembly.

ICSU — a thumbnail sketch

ICSU is the successor to the former International Research Council. This is relevant to some of the things that ICSU presently does and which sometimes disturb the scientific unions. It is domiciled in Brussels and has its Secretariat in Paris in much the same way as IUPAC is set up correspondingly in Zürich and Oxford. It has four objectives which may be summarized as follows:

1. the encouragement of international scientific activity for the good of humankind and in promotion of peace and international security;
2. the facilitation and coordination of the activities of the international scientific unions;

3. the stimulation, design and coordination of international interdisciplinary scientific research projects and scientific education;
4. the facilitation and coordination of the international activities of its national members.

These objectives contain the seeds of the former International Research Council's activities. In respect of objectives 2 and 4, I should say that ICSU never attempts to interfere in any way with the activities of the Unions any more than with those of its national members, that is, the academies of science. In pursuit of objective 1, it does make grants to the unions from its own funds and other sources of funding to which it has access. Objectives 3 and to some extent 1 give rise to ICSU's global programmes such as the International Geophysical Year (IGY).

ICSU has two types of corporate member as revealed in 2 and 4 above. These are the 20 or so international scientific unions, for example IUPAC, and the over 50 national academies of science. There is no voluntary scheme (such as IUPAC's Affiliate Membership Programme) whereby individual scientists can associate with ICSU.

The General Assembly

The General Assembly of ICSU is quite different from that of IUPAC. There are no masses of scientists huddled around in discussion in meeting rooms and holding joint meetings to sort out interdisciplinary chemical topics as during the first few days of an IUPAC General Assembly. It is more like our Council meeting. It consists of plenary meetings of the 20 or so union representatives with the national delegations each consisting of no more than six or so members. There are also two working group meetings of what used to be called scientific clusters of unions (biosciences and, for brevity, other sciences) and a third working group of national members.

On all matters at the General Assembly, except finance, each union representative has three votes and each national delegation one. This is in principle to balance up the voting power of the two, but I need scarcely add that this arrangement is sometimes a source of contention. On finance, each national delegation and each union representative has one vote.



Prof. C. N. R. Rao, IUPAC President, 1985–87 with ICSU President Prof. M. G. K. Menon (right) at the ICSU General Assembly in Berne, Switzerland, September 1986.

Between General Assemblies, ICSU's affairs are looked after by the General Committee which is fairly analogous to IUPAC's Bureau. The same 20 union representatives serve there and for every two union representatives over 12 there is appointed, by election, one additional representative over ten for the national members. On the General Committee, all the members have one vote each. The President, Past-President, President-Elect, Secretary General and Treasurer constitute the ICSU officers and are members of the General Committee. The latter meets annually.

Between General Committee meetings, the Executive Board of ICSU looks after matters in much the same way as the IUPAC Executive Committee. But, whereas the latter consists of the officers and three (NAO) elected members, the ICSU Board has the officers, three union representatives elected from three electoral colleges of the unions and two representatives of the national members.

I should add here that the number of the latter was increased to three with effect from the Sofia Assembly. The Chairman of the Standing Committee on Finance is *ex officio* a member of the Executive Board. Apart from the SFC, just mentioned, ICSU has Standing Committees on Admissions, Structures and Statutes; Free Circulation of Scientists; International Science and its Partners; and Assessment and Priorities. The recently formed Committee on Ethical Problems of Science has become defunct, due apparently to lack of business.

Because of objective 3, but also increasingly 4 I suspect, there are a number of scientific and special committees, which I will not differentiate here. These are 13 in number at present, for example SCOPE (Scientific Committee on Problems of the Environment) and CODATA (Scientific Committee on Data for Science and Technology).

These committees are becoming increasingly important in overall ICSU thought and planning as readers of previous Secretary General columns in

these pages will have surmised, for example, in relation to IGBP (International Geosphere–Biosphere Programme) and COBIOTECH (Scientific Committee for Biotechnology). In addition, ICSU has four or five inter-union commissions such as CASAFA, already mentioned, which are really embryo scientific and special committees. There are four or five joint programme committees, for example WCRP, the World Climate Research Programme, and the unfortunately named Advisory Group on Greenhouse Gases, AGGG.

Lastly, in this brief account of ICSU, mention should be made of some 20 or so international scientific associates of ICSU. These are mainly international or regional federations similar to the IUPAC Associated Organizations. Some of them are in fact international scientific unions, for example IUFoST (International Union of Food Science and Technology), which do not represent a single scientific discipline. None of the scientific committees or the international scientific associates has voting rights in ICSU or participation except by invitation though the former draw considerable finance from ICSU and the latter will in future contribute to its funding in a limited way.

Having set the ICSU scene in a somewhat skeletal manner, which I hope will not cause much confusion, I should now proceed with a selection of matters related to IUPAC which occurred or were adumbrated at the Sofia General Assembly.

CASAFA

As expected, CASAFA graduated to full scientific committee status at the Sofia Assembly. A core group committee for the new CASAFA was nominated by the Executive Board and the preliminary programme outlined by the outgoing inter-union CASAFA commission was approved.

The big difference between the old and new CASAFA is that the new one has repeated the same pattern as that of COBIOTECH, i.e. once more the unions have no representation on the central committee. It was done in such a way by the Executive Board that it was not possible to discuss this issue before it was instituted. However, it was pointed out to the old CASAFA, whose officers are now those of the new scientific committee, that our Union at least would welcome representation (as a Union) on the new CASAFA once the latter had time to consider its new status. Considering that one of CASAFA's main thrusts over the next few years is to be on sustainable agriculture, there must obviously be a considerable role for chemistry (*sic* IUPAC) to play.

The 'old' CASAFA group discussed sustainable agriculture in the context of, mainly tropical, developing countries. Members from Eastern Europe broadened the scope to include problems of



With the world population due to double by the year 2200 there is no chance of providing sufficient food without the use of fertilizers and pesticides. IUPAC can scarcely stand aside from this issue.

'food security,' that is the ability of a country to feed its own population. Other delegates, including IUPAC's, widened the issue further to include uncertainties and restraints on food production in developed countries that arise from growing pressure to reduce the use of agrochemicals such as fertilizers, pesticides and herbicides.

Whilst no one seeks to justify excessive use of agrochemicals leading to pollution of groundwaters and food itself, there is no doubt that with the world population due to double by the year 2200, there is no chance of providing sufficient food without the use of fertilizers to produce enough cereal and pesticides, fungicides, herbicides and so on to reduce losses during production and storage. IUPAC could scarcely stand aside from this issue and retain its credibility.

COBIOTECH

The Scientific Committee on Biotechnology started off like CASAFA in recent years as an inter-union committee involving IUPAC and three bio-unions. Readers of previous Secretary General columns in this magazine will be well aware of the concern felt by IUPAC when it suddenly found itself excluded from the steering committee of the newly formed

COBIOTECH. However, the position as I have explained in the previous issue (see page 97 of the May 1991 issue of *CI*) so that we can maintain full contact with the steering committee and have a real dialogue with the other unions active in biotechnology in ICSU round a common debating table. This should allow us to plan our own programmes better and to have improved input to the COBIOTECH programme. However, with the present unformalized system of representation of our Union on both COBIOTECH and CASAFA, vigilance will be necessary on our part to ensure that chemistry's interests continue to be served.

Weapons of mass destruction

ICSU previously had a committee on ethical problems of science in pursuit of objective number 1 to which our Council in 1989 directed a query from one of our National Adhering Organizations (NAOs) regarding our attitude to the construction and use of chemical weapons. As I explained before (see page 97 of May 1991 issue of *CI*), this committee unfortunately became moribund so that there was no progress to report at the ICSU General Assembly. However, the ICSU Executive Board was requested to discuss this matter and we will await the outcome of their discussions in June and any matters they refer to the General Committee meeting in October.

ICSU matters of import to IUPAC

Two years ago there was considerable discussion within ICSU about reducing the frequency of their general assembly meetings to a triennial instead of a biennial basis and the annual meetings of the General Committee to take place instead every 18 months. Most of the scientific unions do in fact hold triennial general assemblies, IUPAC with one other, being exceptional in having biennial assemblies. At that time most of the unions and several of the national members were of the opinion that the loss of visibility to ICSU would be counter-productive and there were doubts if there would be any great economies to result. However, the same proposals were raised again in a more structured way in Sofia. Several of the unions, including IUPAC, and one or two national members were once again unenthusiastic, although not strongly so. The motion was passed, and the next ICSU General Assembly will be held in Santiago, Chile in 1993. This will of course be the year of an IUPAC General Assembly. We never had clashes of assemblies previously because IUPAC meets biennially in odd-numbered years and ICSU met similarly in even-numbered ones.

This new development is likely to cause problems for our representatives in future because it would appear to be essential for our Union to be represented at a high level and whoever attends should also be fully cognizant of our Union's current

thinking by being present at its assembly and so be able to respond authoritatively and with confidence at ICSU. Few will relish the prospect of having to attend two such meetings consuming a total of three to four weeks in close proximity. Additionally, they both demand a good deal of preparation beforehand and work afterwards.

The resolution to hold the General Committee meetings less frequently was resisted strongly by most unions and there was a good deal of quite heated debate. Most of the national members felt that the unions were not paying sufficient attention to the cost of these annual meetings whilst the unions thought it necessary to meet annually to conduct inter-union affairs, interact round the table with ICSU generally and maintain their contacts with the scientific committees.

When it came to the vote, the motion was lost because of the threefold greater voting power of the unions relative to the national members on non-financial affairs. Feelings became more polarized. Subsequently the voting powers of the national members on financial matters resulted in a reduction of proposed increases in the national member annual dues to ICSU from a requested 10% in 1992 and 1993 to 5% in each year.

Similarly a proposal to increase the union dues to ICSU from the present 2.5% of their income from their own national members to 3.5% was carried without much enthusiasm from the unions who of course have no option to drop into a lower category of membership as have the national members. The annual dues of the international associates which had previously been zero in most cases and USD 100 in the others was raised to a uniform USD 500 per annum.

Warning signs for IUPAC?

It could well be that our Union will feel the undertow of these events in Sofia in due course for the national members of ICSU are in many cases the self-same NAOs of IUPAC. There may therefore be stiffened resistance to IUPAC's proposal to increase its national subscriptions with effect from 1992. There may also be pressure brought to bear for IUPAC to move to a triennial general assembly.

This could have quite serious consequences for IUPAC. As mentioned earlier, what goes on at an IUPAC General Assembly is very different from that at an ICSU one. There is a good deal of interdisciplinary activity and joint discussions during the first four days of the commission meetings and the two or so days of the Divisional Committee and Bureau meetings. In addition, it is a fact of life that output peaks before assemblies; a three yearly peak would undoubtedly produce less and the loss of impetus between assemblies would probably be correspondingly more serious. All of

this would come at a particularly bad time as we face up to the consequences of the recent reorganization of the Union.

Internal changes in ICSU

Within ICSU the unions conduct their interdisciplinary affairs largely in two working groups. For the sake of brevity I have already called these 'bio-unions' and 'other-unions'. This has always caused the IUPAC representative some difficulty because (s)he has a need to have a foot in both camps. In electoral matters, the 'other-unions' split into two groups which, again for brevity, I will call (a) chemical, mathematical and physical sciences and (b) earth and space sciences. However, there is now concern that these working groups or cluster groups, as they were called before they began to undertake various activities for the Executive Board, are not ideally suited to these tasks, for example, the monitoring and assessment of the work of the scientific and special committees. This is to be looked into by the Executive Board before the next assembly.

ICSU occupies quite a unique role on the international scientific scene combining, as it were, the roles of the national academies of science and the supra-national characteristics of bodies such as UNESCO but completely without political influences. It also acts as an interdisciplinary coordinator between the scientific unions and to a certain extent as the social conscience of science, a role which is not duplicated elsewhere. Its global programmes such as the IGY, which I mentioned already, and now the IGBP, a set of initials well known to readers of the Secretary General's column, are impressive and most influential. Other such programmes will no doubt follow, although funding may be a serious obstacle.

National members of ICSU give support to ICSU and also to some of the individual global programmes. In the past the launching of these programmes does not appear to have caused the scientific unions any great problems, but recently there has been unease expressed by several that they have little say in the conduct or conception of these pan-scientific programmes and that there is no way to break through into them because they are self-governing. However, change is generally healthy in most institutions and much could be done to smooth the furrowed brows in most cases by giving the unions some part to play centrally as in one or two of the longer-established scientific committees. Perhaps the Executive Board plays a too rarified or even Olympean role in its conduct of some of ICSU's affairs in as much as it appears to have been oblivious to these concerns?

ICSU and its affairs are certainly of vital interest to IUPAC.

Cationic polymerizations and related ionic processes Balatonfüred, Hungary 26–29 August 1991

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The 10th International Symposium on Cationic Polymerizations and Related Ionic Processes will be held at Hotel Füred, Balatonfüred, Hungary from 26 to 29 August 1991. The symposium is being organized under the auspices of IUPAC, the Kossuth Lajos University of Debrecen and the Debrecen Group of the Hungarian Academy of Sciences.

The scientific programme includes some 29 invited lectures including one on 'Variety of mechanisms and reaction modes in the polymerization of cyclic imino ethers family' by Prof. Takeo Saegusa — former President of the IUPAC Macromolecular Division. There will also be oral communications of 15 minutes duration and posters with time for discussion after each presentation.

The invited lectures presented at the symposium will be published in a special volume of *Die Makromolekulare Chemie — Macromolecular Symposia*.

The registration fees are USD 350 (full), USD 130 (student) and USD 60 (accompanying) with a 10% reduction for IUPAC affiliate members. Meals and accommodation are not included in the registration fee.

Accommodation is available in the three-star Hotel Füred — venue of the symposium. The rate for a double room with full board is USD 85 (single) and USD 110 (double) per day.

Balatonfüred, on the northern shores of Lake Balaton, is accessible by train, bus or car. The nearest international airports are Budapest and Vienna.

Positron annihilation Szombathely, Hungary 26–31 August 1991

IUPAC
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The 9th International Conference on Positron Annihilation (ICPA-9) will be held in Szombathely, Hungary from 26 to 31 August 1991. The conference will present a wide-ranging survey of the present state of art and future prospects of research with positrons. The official language of ICPA-9 is English.

The following list presents the groups of topics on which the scientific programme of ICPA-9 will concentrate:

- fundamental aspects of positron and positronium research: atomic physics; astrophysics;
- electronic structure and defect studies: metals, non-metals; semiconductors, superconductors;
- positron and positronium beams: surface, near-surface and interface phenomena;
- positron and positronium chemistry: fluids and gases, organic materials, polymers, biological applications;
- positron emission tomography (PET);
- advances in experimental and evaluation techniques;
- positrons in education.

Review talks lasting about 45 minutes will be given in areas of general interest and current importance for the positron community, mainly by 'non-positron' specialists. These review talks will include:

- Advances in medical applications of PET (L. F. Feinendegen, Jülich);
- Annihilation (I. Lovas, Budapest);
- Fundamental positronium physics: present and future (A. P. Mills, Bell Labs).

Additional review talks will be selected from the following topics:

- exciting problems in chemistry;
- high- T_c superconductors;
- defects in semiconductors;
- defects in metals and alloys;
- density functional theory;
- antihydrogen research.

The most important new results on positron and positronium physics and chemistry will be reported in 25-minute invited talks. Poster presentations and numerous short oral talks of (12 minutes) in parallel sessions will also be organized. To facilitate effective exchange of scientific ideas, workshops — probably three — will be organized. Suggested tentative topics are:

- theory of e^+e^- correlations;
- 2D ACAR techniques;
- defects in semiconductors;
- e^+ beams;
- new developments in e^+ techniques;
- high- T_c research with positrons.

All contributions accepted for presentation at ICPA-9 will appear in a special issue of *Materials Science Forum* published by Trans Techn Publications, Aedermannsdorf, Switzerland. In addition, it

is planned that a book of the proceedings will also be published for the conference participants and for general sale. One copy of the proceedings is included in the participation fee.

In conjunction with ICPA-9, an exhibition of scientific equipment and books related to positron annihilation and nuclear spectroscopy will be organized.

The registration fees are DEM 420 for scientific participants, DEM 280 for students and DEM 140 for accompanying persons. The fee covers conference attendance, programme, book of abstracts, welcome refreshments, get-together party, excursion, refreshments in breaks, and the conference proceedings. IUPAC affiliates are eligible for a 10% reduction in the fee.

Accommodation will be available in students' hostels (DEM 18 single; DEM 10 double) and hotels (from DEM 65 single/DEM 35 double to DEM 85 single/DEM double).

The conference will be held in Szombathely which is the economic and cultural centre of the West Transdanubian area. The town, one of the oldest in Hungary, is near the Austrian border. The weather in Hungary in late August-early September is general mild and dry. The daily temperature may range from 18 to 28°C. In the evening it rarely gets colder than 12°C. The likelihood of rain in this period is about 15%.

Spectroscopy of Biological molecules

York, UK

1-6 September, 1991

IUPAC
SPONSORED

The 4th European Conference on the Spectroscopy of Biological Molecules will be held at the University of York, UK, from Sunday 1 to Friday 6 September 1991.

This is the latest in a series of biennial conferences on this topic. Previous meetings having taken place at Bologna (1989), Freiburg (1987) and Reims (1985). In addition to IUPAC sponsorship, the meeting is co-sponsored by the Association of British Spectroscopists, the Biochemical Society, the Federation of European Chemical Societies (FECS), the Institute of Biology, the Institute of Physics, the International Union of Biochemistry (IUB), the Royal Society of Chemistry, and the Society of Chemical Industry (SCI).

This major international conference will focus mainly on the structure and dynamics of biological and related systems as determined by Raman and infra-red spectroscopic methods. However, it will also provide a critically comparative review of recent progress in this field as achieved through the application of other methods, particularly NMR, EPR, CD, optical absorption and fluorescence, and

X-ray crystallography in conjunction with computer graphics. An emphasis will be given to currently 'hot' topics such as protein folding, biomolecular interactions and dynamics, supramolecular organization, and ultrafast photobiological processes.

The meeting will consist of nine keynote lectures and 33 other invited lectures, some of these being selected from contributed papers. There will be no parallel sessions. Poster sessions and a major exhibition of spectroscopy instrumentation will accompany the lecture programme. There will be a Wednesday evening discourse to address the question

'What are the important issues in biomolecular structure and dynamics today?' This being led by a panel of distinguished spectroscopists and crystallographers and providing wide-ranging opportunities for discussion. Topics included in the meeting are:

- Proteins — structure, conformation and dynamics;
- Chromophoric proteins — haem systems, rhodopsins, photosynthetic systems, etc.;
- Enzymes — reaction kinetics and mechanism; substrate/inhibitor interactions;
- Nucleic acids — structure, conformation and dynamics; drug interactions;
- Protein-nucleic acid interactions;
- Carbohydrates — oligo and polysaccharides, glycoconjugates;
- Biomembranes — lipids, organization, interactions with proteins;
- Biomedical/biotechnological applications;
- Experimental methods;
- Theoretical methods; and
- Other topics.

Among those who have agreed to speak are: S. A. Asher (UVR, proteins), G. T. Babcock (photosynthetic systems), L. D. Barron (ROA, chiral molecules), J. Breton (photosynthetic reaction centres), G. G. Dodson (protein crystallography), M. A. El-Sayed (photobiology), C. D. Garner (EXAFS of metalloproteins), J. Greve (micro-Raman, whole cells), R. M. Hochstrasser (TRIR, heme proteins), J. Holbrook (enzymes), R. E. Hubbard (biomolecular graphics), M. Karplus (spectroscopy and simulations), T. A. Keiderling (VCD, proteins), T. Kitagawa (heme proteins), D. Klug (photoreaction dynamics), Y.



Koyama (photosynthesis), D. Lee (FTIR, protein structure), I. W. Levin (membranes), H. H. Mantsch (FTIR, biomembranes), T. A. Mattioli (RR/FTR, photosynthesis), R. Mendelsohn (FTIR, membranes), G. C. K. Roberts (NMR of enzymes), F. Siebert (FTIR, bacteriorhodopsin), G. Smulevich (RR, cytochrome), T. G. Spiro (protein structure), J. Turner (RR, peroxidases), G. J. Thomas (viruses), A. J. Thomson (MCD of metalloproteins), H. Vogel (membrane proteins) and N-T. Yu (FTR, vitamin B12).

The conference language will be English.

The registration fee will be GBP 130 for full participants, GBP 65 for *bona fide* students, and GBP 50 for accompanying persons. The fees include the cost of the book of the conference proceedings and the opening reception on Sunday evening, 1 September. On-campus accommodation will cost approximately GBP 100 for five nights. Low-cost meal tickets will be available for advance purchase. York city hotels are also available at standard commercial rates.

Located half-way between London and Edinburgh, the 2000-year-old City of York, with its medieval centre, magnificent cathedral, and outstanding museums, is surrounded by some of the most beautiful countryside in England. The Yorkshire Moors and Dales are nearby, and the seaside towns

of Whitby (home of Captain Cook) and Scarborough only about an hour's drive away. A programme of social events and tours will be arranged for participants and accompanying persons. An opening reception will be held on the University of York campus and others through the week will take place at The King's Manor and in famous museums in the city. A visit to the magnificent York Minster, one of the largest and most beautiful cathedrals in Europe, and a walking tour around the ancient City Walls will be arranged. The mid-week tours into the lovely countryside of the Yorkshire Dales and the North Yorkshire Moors will include walking opportunities, a visit to the splendid ruins of Fountains Abbey, and afternoon tea at Ripley Castle or the stately home of Castle Howard. The conference banquet will be held in the Merchant Adventurers' Hall, one of York's picturesque medieval dining halls.

York is best reached from London by rail (frequent service daily, travel time approximately 2 hours). Manchester also has an international airport (approximately 1½ hours by rail to York). Leeds/Bradford is the local airport, approximately 25 miles (40 km) away. North Sea ferries operate regular services from many continental ports into Kingston upon Hull, located some 40 miles (65 km) away. Ample parking is available on the University campus.



Electron spin echo spectroscopy *Novosibirsk, USSR* *25–28 September 1991*

IUPAC
SPONSORED

The ISMAR Workshop on Electron Spin Echo Spectroscopy will be held in Novosibirsk, USSR from 25 to 28 September 1991. The workshop is being organized by the Institute of Chemical Kinetics and Combustion, Siberian Division of the USSR Academy of Sciences under the sponsorship of IUPAC and Bruker Analytische Messtechnik GmbH. A Bruker ESP-380 Fourier transform EPR spectrometer is expected to be presented at the workshop.

The workshop will cover problems related to novel trends in experiment, theory and instrumentation of ESE and its applications to physics, chemistry and biology. The following ESE specialists have accepted invitations to deliver plenary lectures: M. K. Bowman (Argonne); S. A. Dzuba (Novosibirsk); J. Forrer (Zürich); D. Goldfarb (Rehovot); E. Groenen (Leiden); A. J. Hoff (Leiden); T. Ichikawa (Sapporo); L. Kevan (Houston); Ya. S. Lebedev (Moscow); J. R. Norris (Argonne); D. van Ormondt (Delft); J. Peisach (New York); A. M. Raitsimring (Novosibirsk); E. Reijerse (Nijmegen); M. Romanelli (Potenza); K. M. Salikhov (Kazan); J. Schmidt (Leiden); A. Schweiger (Zürich); D. J.



Novosibirsk Akademgorodok.

Singel (Cambridge, USA); Yu. D. Tsvetkov (Novosibirsk); and G. Voelkel (Leipzig).

Other communications will be presented in oral and poster forms. The abstracts of plenary lectures and other communications will be printed for distribution to all participants. The full texts are planned to be published in *Pure and Applied Chemistry*.

The official language of the workshop will be English. All presentations and publications will be in English.

The registration fee for the workshop is USD 100 for active participants with a 10% reduction for IUPAC affiliates and USD 30 for students and accompanying persons.

The workshop will be held at the House of Scientists of Novosibirsk Akademgorodok. Accommodation for all participants will be arranged at the Golden Valley hotel situated a few minutes walk from the House of Scientists.

Olefin and vinyl polymerization Hangzhou, China 14–18 October 1991

IUPAC
SPONSORED

The IUPAC International Symposium on Olefin and Vinyl Polymerization and Functionalization — Reactions, Mechanisms and Industrial Applications will be held at the Zhejiang University Conference Center, Shao Yifu Science Building in Hangzhou, China.

The following plenary lectures will be presented at the meeting:

- The role of amines in vinyl polymerization (X. D. Feng, China);
- Advances in Ziegler–Natta polymerization (P. Galli, USA);
- Photo-initiated graft copolymerization and cross-linking of polymers (B. Ranby, Sweden).

In addition there will be 17 invited lectures including one on 'Unusual synthesis of vinyl monomers and polymers' by Prof. W. Heitz — President of the IUPAC Macromolecular Division.

The following are the topics for the contributed papers:

- free radical and photo-induced polymerization;
- Ziegler–Natta and related polymerization;
- polymer functionalization and chemical modification;
- panel discussion on 'Importance of polymer synthesis in the future polymer world.'

The official language is English. No arrangements will be provided for simultaneous interpretation.

The registration fees are: USD 300 for active participants; USD 150 for students and USD 120 for accompanying persons. The fees for active participants include participation in all scientific sessions, preprints and all symposium printed materials, local excursion, banquet and bus service between airport or train station and hotel.

Various categories of hotel rooms are available: Class A — USD 75.00 per night; Class B — USD 45.00 per night.

Conference postponed

The Organizing Committee, Advisory Committee and Board of Trustees of the 10th International Conference on Computers in Chemical Research and Education (ICCCRE) have decided to postpone the conference due to the general situation in the Middle East. This IUPAC sponsored conference was to have taken place from 14 to 19 July 1991 in Jerusalem, Israel. It will now take place at the same venue from 12 to 17 July 1992. The organizers hope that all the invited lecturers will be able to attend the meeting on the new date.

Antarctic science — global concerns

The Scientific Committee on Antarctic Research (SCAR) of the International Council of Scientific Unions (ICSU) is organizing an International Conference on Antarctic Science — Global Concerns. The conference will be held in Bremen, Germany, 23–27 September 1991. Conference topics will include the ozone hole and its consequence for living systems, and the Southern Ocean and the 'greenhouse effect'.

For further information contact: Dr G. Hempel, Antarctic Science — Global Concerns, Alfred-Wegener-Institut, PO Box 12 01 61, D-2850 Bremerhaven, Germany. Fax: +49 (471) 4831149. Telex: 238695 polar d.

European Congress on Mixing

The 7th European Conference on Mixing will take place in Brugge, Belgium, 18–20 September 1991. The meeting is being held under the auspices of the European Federation of Chemical Engineering — an Associated Organization of IUPAC. Conference topics include: mixing of homogeneous Newtonian or non-Newtonian fluids; mixing technology of heterogeneous systems; mixing and chemical reactions; and mixing in the process industries (e.g. food, pharmaceutical, petrochemical, and polymer industries).

For further information contact: 7th European Conference on Mixing, c/o TI-K.VIV, Attn Ms Rita Peys, Desquindreij, B-2018 Antwerpen, Belgium. Tel. +32 (3) 216 09 96. Fax: +32 (3) 216 06 89.

Secondary ion mass spectrometry

The 8th International Conference on Secondary Ion Mass Spectrometry (SIMS VIII) will be held, under the auspices of the Royal Netherlands Chemical Society, at the RAI Congress Centre, Amsterdam, The Netherlands, from 15 to 20 September 1991.

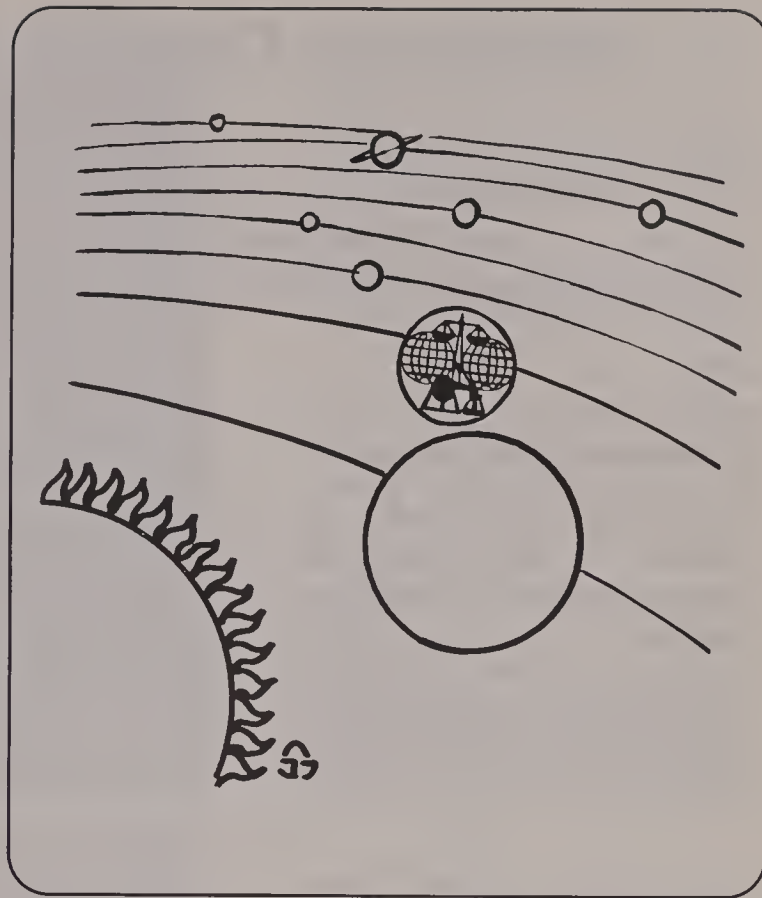
SIMS VIII will cover a wide range of aspects of secondary ion mass spectrometry: fundamentals: quantification; new developments; instrumentation; various applications (semiconductors, electronics, polymers, biology, geology and metallurgy). The opening lecture will be given by Prof. W. Paul, winner of the 1989 Nobel prize for physics.

Conference Secretariat: SIMS VII, Van Namen & Westerlaken Congress Organization Services, PO Box 1558, 6501 BN Nijmegen, The Netherlands. Tel: +31 (80) 234471. Fax: +31 (80) 601159.

Food science and technology

The 8th World Congress of Food Science and Technology, sponsored by the Canadian Institute of Food Science and Technology under the auspices of the International Union of Food Science and Technology, will take place in Toronto, Canada, from 29 September to 4 October 1991.

For further information contact: 8th World Congress of Food Science and Technology, 3340 Orlando Drive, Mississauga, Ontario, Canada L4V 1C7. Fax: +1 (416) 678 1229.



Technician education and training for R&D

The 2nd International Symposium on Technician Education and Training for Research and Development, sponsored by UNESCO and Institut Kimia Malaysia, will take place in Kuala Lumpur, Malaysia, 19-22 November 1991.

The overall aim of the symposium will be to advance and increase the effectiveness of education and training for technicians working in institutions of higher learning, in research organizations and in industry, thereby contributing to the enhancement of regional scientific research and development activities of potential economic value.

The symposium will comprise a range of activities: plenary sessions, workshops, case studies, invited contributions, poster paper sessions, experimental demonstrations, discussion of advances in education technology, curriculum development and assessment methodologies. These are designed to develop regional activities and to enhance international collaboration in an area of education which is recognized as being of vital importance to economic and social development.

For further information/application form please contact: EITHER — R. J. A. Bradley, Symposium Secretary, Dublin City University, Dublin 9, Ireland. Tel: +353 (1) 370077 Fax: +353 (1) 360830; OR — Lim Teck Thai, Hon. Secretary, Institut Dimia Malaysia, 129B, Jalan Aminuddin Baki, Taman tun Dr Ismail, 60000 Kuala Lumpur, Malaysia. Tel: +60 (3) 7189909. Fax: +60 (3) 7177354.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1991

Surface and colloid science

7–12 July. 7th International Conference on Surface and Colloid Science. Compiègne, France.

(Secretariat of the 7th ICSCS, c/o Wagons-Lits Tourisme, B.P. 244, F-92307 Levallois-Perret Cédex, France.)

Solution chemistry

4–19 July. 22nd International Conference on Solution Chemistry. Linz, Austria.

(XXII ICSC, Institut für Chemische Technologie, Anorganischer Stoffe, Johannes Kepler Universität, A-4040 Linz, Austria.)

Rheology of polymer melts

15–18 July. 14th Discussion Conference on macromolecules Rheology of Polymer Melts. Prague Czechoslovakia.

(14th Discussion Conference, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia. Tel. +42 (2) 360341. Fax +42 (2) 367981. Telex 122019 IMCP C.)

Plasma chemistry

4–9 August. 10th International Symposium on Plasma Chemistry. Bochum, Germany.

(Unikontakt, Ruhr-Universität Bochum, Postfach 102148, 4630 Bochum 1, Germany. Tel: +49 234 700 2250. Fax: +49 234 700 2232. Telex 0825860.)

IUPAC General Assembly

7–15 August. 36th IUPAC General Assembly. Hamburg, Germany.

(The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

IUPAC Congress

17–22 August. 33rd IUPAC Congress. Budapest, Hungary.

(33rd IUPAC Congress, Prof. E. Pungor, c/o Hungarian Academy of Sciences, H-1111 Budapest, Gellért tér 4, Hungary. Tel. +36 (1) 664 705. Fax: +36 (1) 851 477. Telex 225931 MUEGY H.)



Budapest: venue of the 33rd IUPAC Congress on 17–22 August.

Organometallic chemistry

25–29 August. 6th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS). Utrecht, Netherlands.

(Symposium Secretariat OMCOS 6, Congress Bureau, Royal Dutch Fairs, PO Box 3503 RM Utrecht, The Netherlands.)

Chemical education

25–30 August. 11th International Conference on Chemical Education. York, UK.

(Dr J. F. Gibson, The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN. Tel. +44 (71) 437 8656. Fax. +44 (71) 437 8883.)

Analytical sciences

25–31 August. International Congress on Analytical Sciences. Chiba, Japan.

(ICAS '91 Secretariat, The Japan Society for Analytical Chemistry, 1-26-2, Nishigotanda, Shinagawa, Tokyo 141, Japan. Tel. +81 (3) 34903351. Fax. +81 (3) 34903572.)

Cationic polymerization

26–29 August. 10th International Symposium on Cationic Polymerization and Related Ionic Processes. Balatonfüred, Hungary.

(Prof. T. Kelen, Institute of Applied Chemistry, Kossuth Lajos University, H-4010 Debrecen, Hungary.)

Positron annihilation

26–31 August. 9th International Conference on Positron Annihilation. Szombathely, Hungary. (ICPA-9, H-1536 Budapest, PO Box 398, Hungary.)

Spectroscopy of biological molecules

1–6 September. 4th European Conference on the Spectro-

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than 3 months in advance. If a visa is not granted 1 month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

In the case of the 32nd IUPAC Congress (Stockholm, Sweden: 2–7 August 1989), it was observed that the time for treating visa applications in Sweden may be as long as 5–6 weeks. To this must be added the time for handling the applications at the Swedish Embassy in the various countries of the intending participants. This confirms the need for applications to be made not less than 3 months in advance.

scopy of Biological Molecules. York, UK.

(Prof. R. E. Hester, Department of Chemistry, University of York, Heslington, York YO1 5DD, UK. Tel. +44 (0904) 59861. Telex 57933 YORKUL G.)

Macrocyclic chemistry

1–6 September. 16th International Symposium on Macrocyclic Chemistry. Sheffield, UK.

(Dr D. E. Fenton, Department of Chemistry, The University, Sheffield, S3 7HF, UK. Tel. +44 (0742) 768555. Fax: +44 (0742) 739826. Telex 547216 UG SHEF G.)

Mössbauer effect

16–20 September. International Conference on the Applications of the Mössbauer Effect. Nanjing, China.

(Prof. Y. F. Hsia, Chairman, ICAME '91, Department of Physics, Nanjing University, Nanjing 210008, P. R. China. Tel: +86 (025) 647361. Fax. +86 (025) 403435. Telex 34151 PRCNU CN.)

Recycling of polymers

18–20 September. International Symposium on Recycling of Polymers: Science & Technology. Marbella, Spain.

(Prof. W. Heitz, Philipps-Universität Marburg, Physikalische Chemie, Hans-Meewein-Strasse, D(W)-3550 Marburg, Germany. Tel. +49 (6421) 285777. Fax. +49 (6421) 285785. Telex. 482373 UMR D.)

Self-propagating high-temperature synthesis

23–28 September. 1st International Symposium on Self-Propagating High-Temperature Synthesis (SHS). Alma-Ata, USSR.

(Symposium Organizing Center, Institute of Structural Macrokineics, USSR Academy of Sciences, 142432 Chernogolovka, Moscow Region, USSR.

Electron spin echo spectroscopy

25–28 September. International Workshop on Electron Echo Spectroscopy. Novosibirsk, USSR.

(Prof. Yu. D. Tsvetkov, Institute of Chemical Kinetics & Combustion, 630090 Novosibirsk, USSR. Tel. +7 (3832) 354832. Fax. +7 (3832) 352350. Telex 133148 KING SU.)

Macromolecule–metal complexes

30 September–5 October. 4th International Symposium on

Macromolecule–Metal Complexes. Siena, Italy.

(Prof. R. Barbucci, Dipartimento di Chimica, Università di Siena, Piano dei Mantellini 44, 53100 Siena, Italy.)

Olefin and vinyl polymerization

14–18 October. International Symposium on Olefin and Vinyl Polymerization and Functionalization — Reaction, Mechanism and Industrial Application. Hangzhou, China.

(Secretariat of IUPAC Polymerization 91 Hangzhou, Prof. Zhen-Hua Huang, Director of International Programs Office, Zhejiang University, Hangzhou 310027, China.)

New polymers

30 November–1 December. International Symposium on New Polymers. Kyoto, Japan.

(Prof. Toshinobu Higashiura, Department of Polymer Chemistry, Kyoto University, Yoshida, Sakyo-ku, Kyoto 606, Japan.

CHEMRAWN VII

2–6 December. World Conference on Chemistry of the Atmosphere: Its Impact on Global Change. Baltimore, Maryland, USA.

(CHEMRAWN VII Secretariat, c/o American Chemical Society, 1155, 16th Street, N.W., Room 205, Washington, DC. 20036-4899, USA.)

1992

Enzymes in organic synthesis

6–9 January. International Symposium on Enzymes in Organic Synthesis. New Delhi, India.

(Dr V. S. Parmar, Department of Chemistry, University of Delhi, Delhi-110 007, India. Tel. +91 (11) 2918994 (office) or +91 (11) 7115562 (home). Fax. +91 (11) 352471. Telex 78099-DU-IN.)

Organic synthesis

28 June–2 July. 9th International Conference on Organic Synthesis. Montréal, Québec, Canada.

(Prof. Jean-Claude Richer, Département de Chimie, Université de Montréal, CP 6128 succursale A, Montréal, Québec H3C 3J7, Canada.)

Ring opening polymerization

7–12 July. International Symposium on Ring Opening Polymerization. Warsaw, Poland.

(Prof. Zbigniew J. Jedlinski, Institute of Polymer Chemistry, Polish Academy of Sciences, 34 M. Curie-Skłodowska St, 41-300 Zabrze, Poland.)

Computers in chemical research and education

12–17 July. 10th International Conference on Computers in Chemical Research and Education. Jerusalem, Israel.

(Professor Y. Wolman, Department of Organic Chemistry, The Hebrew University, Jerusalem 91904, Israel.)

Risk management of chemicals

13–16 July. International Symposium on Risk Management of Chemicals. Can Chemicals Be Used Safely? Guildford, UK.

(Dr J. F. Gibson, Secretary (Scientific), The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

Macromolecules

13–18 July. 34th International Symposium on Macromolecules. Prague, Czechoslovakia.

(IUPAC Macro 92 Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského nám. 18882/2, 16206 Prague 6, Czechoslovakia. Tel. +42 (2) 360317. Telex 122019 IMCP C.)

Coordination chemistry

19–24 July. 29th International Conference on Coordination Chemistry. Lausanne, Switzerland.

(Prof. A. E. Merbach, Institut de Chimie Minérale et Analytique, Université de Lausanne, Place du Château 3, CH-1055 Lausanne, Switzerland.)

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably **2 YEARS** and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *CI*, Vol. 11, No. 1, pp. 4–5, 1989.

Exploration, mining and processing of materials

2–7 August. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Randburg, Transvaal, South Africa.

(The Symposium Secretariat, Mintex, Private Bag X3015, Randburg, 2125 South Africa. Tel. +27 (11) 7933511 Fax. +27 (11) 7932413 Telex 424867 SA.)

Chemical thermodynamics

16–21 August. 12th International Conference on Chemical Thermodynamics (ICCT). Utah, USA.

(Prof. E. M. Wooley, Department of Chemistry, Brigham Young University, Provo, Utah 84602, USA.)

Natural products

30 August–4 September. 18th International Symposium on Natural Products. Strasbourg, France.

(Prof. G. Ourisson, Centre de Neurochimie, 5 rue Blaise Pascal, F-67084 Strasbourg, France.)

Analytical chemistry

20–26 September. SAC 92: International Conference on Analytical Chemistry. Reading, UK.

(The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

1993

Boron chemistry

11–15 July. 8th International Meeting on Boron Chemistry (IMBERON VIII), Tennessee, USA.

(Prof. G. W. Kabalka, Director of Basic Research, the University of Tennessee, Biomedical Imaging Center, 575 Buehler Hall, Knoxville, Tennessee 37996-1600, USA.)

Bioorganic chemistry

7–10 June. 2nd International Symposium on Bioorganic Chemistry, Fukuoka, Japan.

(Prof. Yukito Murakami, Department of Organic Synthesis, Faculty of Engineering, Kyushu University, Hakozaki, Higashiku, Fukuoka 812, Japan.)

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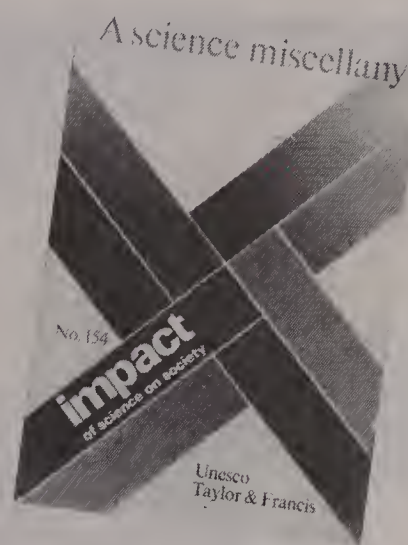
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Volume 41 (1991) Quarterly
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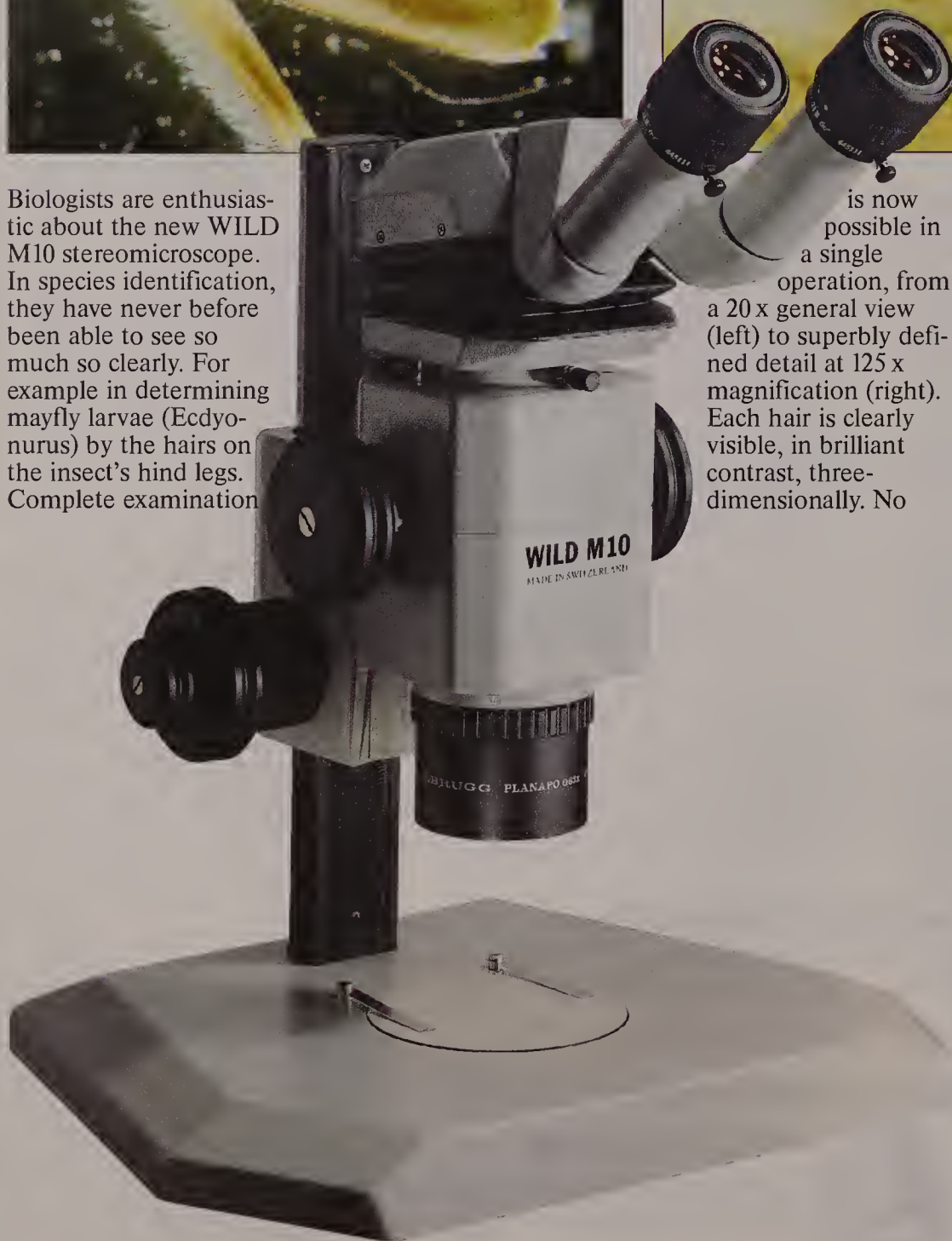


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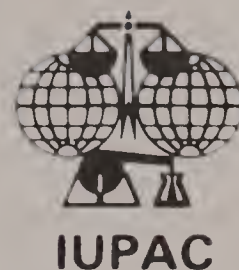
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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

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Chemistry International

The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



1991, Vol. 13. No. 5 (September)

Blackwell Scientific Publications

Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Six issues of *Chemistry International* will be published in 1991. The 1991 subscription rate including postage is GBP 37.50 (UK), GBP 37.50 (overseas except North America) USD 58.00 (US and Canada). The individual subscription rate is USD 33.00. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Blackwell Scientific Publications Ltd, PO Box 88, Oxford, UK.

Advertising. Enquiries should be sent to The Editor, *Chemistry International*, at the above address, or the Advertising Manager, Blackwell Scientific Publications Ltd, Osney Mead, Oxford OX2 0EL, UK (telephone no. +44 (865) 240201, telex 83355 Medbok G, fax +44 (865) 721205).

Despatch. The news magazine is despatched within Europe by surface mail, to other continents by various forms of air speeded delivery: to the US* by air freight for forwarding by second class post, to India by air freight for guaranteed local delivery, and to all other countries by Accelerated Surface Post.

Reproduction of Articles

Unless there is a footnote to the contrary, reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*.

This journal is included in the ADONIS service, whereby copies of individual articles can be printed out from compact discs (CD-ROM) on demand. This ADONIS number given below each article is to be used to order a document. An explanatory leaflet giving further details of the scheme is available from the publishers on request.

*Second class postage paid at Rahway, NJ. Post Master, send address changes to *Chemistry International*, c/o Mercury Airfreight International Inc., 2223 Randolph Avenue, Avenel, NJ 07001, USA.

Front cover: Competitive athletics in Oxford (*Photos on front cover and p. 188 courtesy of Oxford & County Newspapers*).

Affiliate Affairs

Information for Affiliates

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC commissions. A full list of names and addresses of all commission officers for 1989–91 was published on pages 225–235 of the November 1989 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

Free copies of booklet available to affiliates

Copies of an attractive 64-page illustrated booklet on *The IUPAC programme on chemistry and the environment* have been distributed to members of IUPAC commissions and committees, national adhering organizations and other bodies associated with IUPAC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Secretary.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International (CI)*, please indicate that the letter is 'Submitted for publication in *CI*'.

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2–3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF
UK

Tel: +44 (865) 747744
Fax: +44 (865) 747510
Telex: 83220 IUPAC G

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in blue and black on a white background and is approximately 42 × 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon *or* navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 88 of the July 1990 issue of *CI*. Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually — but not always — announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal.

Understanding radiation

A new booklet on this topic has been published by the United Kingdom Atomic Energy Authority (see page 182).

Copies are available, free of charge, from: Information, B465 Harwell, Didcot, Oxfordshire, OX11 0RA, UK or by telephoning +44 (235) 435731.

Environmental health criteria

Several of the most recent volumes in the *Environmental health criteria* series, published by the World Health Organization (WHO), are reviewed on pages 182–186 of this issue. Discount prices for these reports are available in developing countries. *Copies of reports in this series may be purchased from national WHO sales agents or in case of difficulty from WHO, Distribution and Sales, 1211 Geneva 27, Switzerland.*

CHEMRAWN VII: Chemistry and the atmosphere

The World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change is the 7th in the series of IUPAC-sponsored conferences devoted to Chemical Research Applied to World Needs (CHEMRAWN) — see pp. 197–199 of this issue. It will be held in Baltimore, Maryland, USA, on 2–6 December 1991.

The publicity leaflet announcing CHEMRAWN VII indicates that 'some financial assistance may become available to support travel to the conference from scientists from developing countries. Funds are also being raised to support a hands-on instrument workshop for scientists from developing countries which will be held immediately preceding or following CHEMRAWN VII.'



CHEMRAWN VII: Chemistry and the atmosphere — its impact on global change.

For further information contact: CHEMRAWN VII Secretariat, c/o American Chemical Society, Room 205, 1155, 16th Street, NW, Washington, DC 20036-4899, USA.

Aflatoxins in foods and feeds

IUPAC affiliate Prof. U. Samarajeewa (Department of Food Science & Technology, Faculty of Agriculture, University of Peradeniya, Sri Lanka) has formed a Research Group on Mycotoxins in Sri Lanka. The first activity of the group was a workshop on 'Aflatoxins in Foods and Seeds' held on 27–28 March 1991 and organized by the University of Peradeniya and the Institute of Chemistry, Sri Lanka. The activity contributed to the Golden Jubilee celebrations of the University and Institute.



Prof. U. Samarajeewa.

The workshop was attended by 22 participants from the food and feed industry. Topics included: toxicology of aflatoxins; aflatoxins in rice, coconuts and peanuts; pathology of fungal disease; analysis of aflatoxins; prevention and decontamination of aflatoxin in parboiled rice; destruction of mycotoxins in foods by physical and chemical methods; biological control strategies for mycotoxic fungi.

At the concluding discussion it was decided to pursue the following activities:

- establishment of a check sample programme among the laboratories engaged in aflatoxin analysis;
- development of a training programme to train the analysts on aflatoxin analysis;
- collaborative research for control of aflatoxin contamination in maize, soybean and other crops.

Species identification with the WILD M10: unprecedented contrast produces new insights

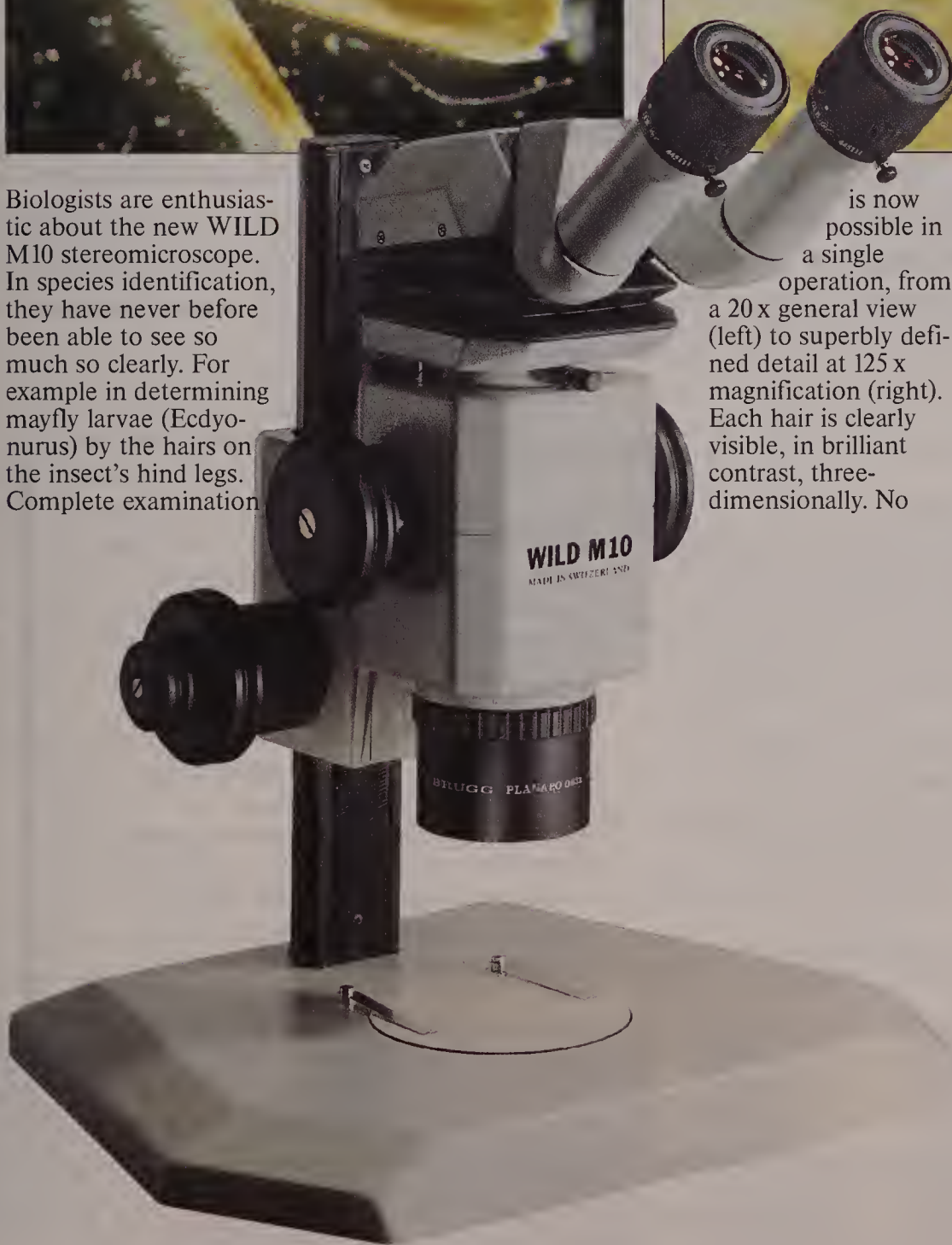


Biologists are enthusiastic about the new WILD M10 stereomicroscope. In species identification, they have never before been able to see so much so clearly. For example in determining mayfly larvae (*Ecdyonurus*) by the hairs on the insect's hind legs. Complete examination



is now possible in a single operation, from a 20 x general view (left) to superbly defined detail at 125 x magnification (right). Each hair is clearly visible, in brilliant contrast, three-dimensionally. No

wonder: the new WILD M10 with its 1:10 zoom range now penetrates into regions that have always had to remain unexplored. Any way you look at it, the WILD M10 is in a class by itself. Find out more. Ask for detailed literature on the new WILD M10.



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**PROCEEDINGS OF THE 1ST INTERNATIONAL
SYMPOSIUM YUGOSLAVIA, 1988**

Edited by **J.R. Shipe Jr.**, and **J. Savory**, both of
the University of Virginia Health Sciences Center,
USA. Published by Blackwell Scientific
Publications on behalf of the International Union
of Pure and Applied Chemistry.

The increasing awareness of the use of performance enhancing drugs in competitive athletics prompted the IUPAC Commission on Toxicology to arrange an International Conference devoted to analytical and clinical aspects of this problem. The resultant International Symposium, held in Yugoslavia in 1988, was attended by participants from 19 countries and included plenary lectures and contributed papers by many of the world's authorities on this subject. The synopses of the open forum discussions and the scientific papers that were presented at the Symposium are published in this volume.

CONTENTS**Analytical Testing:**

Analytical requirements for detection of drug abuse and anabolic steroids
Endocrine effects and immunoassay procedures of anabolics
Detection of the administration of natural androgens
The detection of natural and synthetic corticosteroid administration
The potential applications of an androgen receptor assay for anabolic steroid screening
Potential of HPLC for screening and confirmation of diuretics
Identification of drug metabolites by gas chromatography - mass spectrometry
Mass spectrometry in the 1990s
Drug testing in baseball
Doping in Italy

Regular checking of sportsmen at all levels of competition
Vitakrom-TMN, new phase for the gas chromatography of stimulants in doping control
Identification of Pemoline in urine

Health Effects:

Health risks of steroid use
Potential role of synthetic sex steroids in Hepatocarcinogenesis
Cholinomimetic effects of Carnitine in isolated preparations of masseteric artery and their potential advantage on muscular exercise
Changes on liver, testicle and muscle of experimental animals at training, affected by anabolic steroids
Anabolic steroids depress hepatic monooxygenase activities
Effect of Fluoxymesterone administration on adrenal steroidogenesis in dependence of the sex

1991. 144 pages, 56 illustrations. Printed Case, ISBN 0 632 03181 6.
Price £19.50e, \$37.00

Medicinal chemistry

The Pharmaceutical Society of Japan, founded in 1880, now has more than 19 000 members who actively participate in its scientific activities at conferences and symposia. The annual conference of the society usually consists of 18 sessions of topics such as organic chemistry, pharmacology, clinical chemistry, analytical chemistry and medicinal chemistry.

Last year, the society formed a Division of Medicinal Chemistry with Dr W. Nagata as the first division president. The opening ceremony of this new division was held on 27 March 1991. More than 350 scientists attended the ceremony. They included Prof. C. G. Wermuth and Dr N. Koga, respectively President and Secretary of the IUPAC Section on Medicinal Chemistry.

Professor Wermuth presented the greetings of IUPAC at the opening ceremony. He pointed out that the IUPAC Section on Medicinal Chemistry had spread its recent activities over a wide variety of topics. For example, the section had created a Working Party on Computer Graphics which was concerned with guidelines for publications dealing with molecular modelling.

Another working party is examining natural product sources for medicinal chemistry. The objectives of this project is to facilitate collaboration between natural product scientists and producers in developing countries and pharmaceutical companies. It is also aimed at academic pharmacologists able to test or screen natural molecules or extracts.

Wermuth drew attention to the help Dr Koga had given to the section in initiating the creation of an Asian Federation of Medicinal Chemistry. The corresponding bodies in Europe and USA were taken as models for this.

The role of teaching and education were also being re-examined by the section. It was felt that knowledge of the possibilities opened up by

biotechnologies should be made available to medicinal chemists.

Wermuth suggested that medicinal chemists are not ordinary chemists. He cast doubt on whether chemists have been properly trained in pharmaceutical chemistry. He considered that there is as much difference between a basic chemist and a pharmaceutical chemist as between an architect and a naval architect. Just as an architect who wishes to become a naval architect must have a basic knowledge of the sea and know something about ships, so should a chemist who wishes to become a pharmaceutical chemist know something about biology (i.e. physiology, biochemistry, immunology and pharmacology, and about drugs.

A major project of the section will be the editing and publishing of a book entitled *Medicinal Chemistry for the 21st Century*. This book will be part of a more general IUPAC project devoted to monographs entitled 'Chemistry for the 21st century.' So far, 30 scientists, including three Nobel laureates, have agreed to contribute and to express their personal and prospective views on medicinal chemistry in the future.

Red Book recommendation to be upfixed?

Thoughts on the Red Book (*Nomenclature of Inorganic Chemistry: Recommendations 1990*):

'Having looked through the recommendations, I will not object if authors write azane instead of ammonia, or phosphane instead of phosphine. However, I may suggest a correction (an upfix?) to 'phosphinyl' (phosphino?) in the systematic name of diop. I will no longer be surprised to see a few kappas in an inorganic name, but I will be on guard if *Aust. J. Chem.* receives a paper on ennlnilium (Enn, Element 900).

[From a review of the Red Book by J. R. Zdysiewicz (*Aust. J. Chem.*) published on page 218 of the June 1991 issue of *Chemistry in Australia*.]



From left: Dr N. Koga, Prof. C. G. Wermuth and Dr W. W. Nagata.

We regret to record the deaths of

Prof. N. Montalbetti, Italy (21 May 1991) — President of Clinical Chemistry Division (1989-91)/Vice-President and Secretary (1981-89), Commission on Quantities and Units in Clinical Chemistry (1982-89), Commission on Teaching in Clinical Chemistry (1983-87), *Chemistry International* Editorial Advisory Board (1987-91).



Prof. Norbetto Montalbetti.

Prof. F. D. Rossini, USA (12 October 1990) — Physical Chemistry Division Committee (1953-61), Commission on Thermodynamics (1947-73).

Heaviest element discovered

New Scientist's Aridane has reported that physicists from the Harwell Laboratory, UK, have discovered the heaviest element known to science (*New Scientist*, p. 147, March 1991). According to the report the element has been tentatively named as 'administrium'.

The structure of administrium is somewhat curious. The element has no protons or electrons and its atomic number is nil. However, the Harwell physicists report that it does have 1 neutron, 8 assistant neutrons, 10 executive neutrons, 35 vice-neutrons and 256 assistant vice-neutrons. Furthermore, these particles are held together by a force involving continuous exchange of meson-like particles called morons. The element is completely inert but can be detected chemically because it impedes every reaction it comes into contact with.

Finance committee meeting

On the occasion of the IUPAC Finance Committee meeting in Zürich on 21-22 February 1991, a visit was made to Brauerei Hürliemann AG, which is 150 years old.

During late 1989-90, the accounts of the Union were transferred from its banker, Schweizerische Bankgesellschaft of Zürich, and computerized successfully as the Secretariat. This enabled the 1990 IUPAC accounts to be produced expeditiously

at Oxford for the Finance Committee. It is anticipated that in 1991 the Secretariat will play a more prominent role in handling all income and expenditure payments. The preferred method of effecting payments is likely to be by bank transfer rather than by cheque.

Dr M. Williams

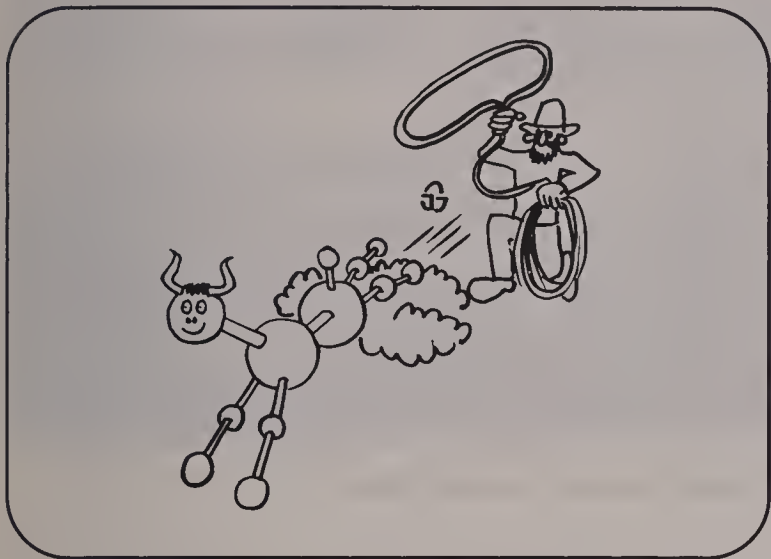


Dr Josef Brunner (Finance Committee, on left), **Prof. Ekkehard Fluck** (Observer from Division/Section Presidents Group) and **Herr Kurt Hedinger** (IUPAC Banker, on right) sample some of the famous brews. **Right: IUPAC Treasurer Anders Björkman** and his wife **Kirsten** inspect a display of beautiful old drinking vessels.



Erratum

On page 46 of the March 1991 issue of the magazine, in an item entitled 'Democracy demands scientific literacy', we erroneously referred to Dr Alan Hayes as the Secretary of the CHEMRAWN Committee. We should, of course, have referred to him as the Vice-Chairman of the Committee. Perhaps we should have added that scientific literacy requires accuracy.



Author deadlines for *CI* 1992

The following are the deadlines for receipt of items at the IUPAC Secretariat in Oxford for publication in 1992 issues of *Chemistry International (CI)*. Authors of feature articles and other lengthy items should submit their contributions well in advance of these dates. Because *CI* is a news magazine it is not possible to guarantee publication of any item in a particular issue. In many cases it is necessary to postpone publication of material to a later issue.

Please note that the International Organization for Standardization (ISO) agreed format for writing dates is used as follows: year-month-day.

CI Vol. 14, 1992 Issue	Deadline for receipt of material
No. 1 (January)	91.09.27
No. 2 (March)	91.11.22
No. 3 (May)	92.01.31
No. 4 (July)	92.03.28
No. 5 (September)	92.05.29
No. 6 (November)	92.07.31

Authors submitting contributions to *CI* are asked to refer to 'Chemistry International: guidelines for authors' (*CI*, Vol. 13, No. 1, pp. 8–9, 1991). Copies of these guidelines are available from The Editor, *Chemistry International*, at the IUPAC Secretariat in Oxford.

Isotope-specific measurements as references

The first meeting of the Limited Life-Time Commission on Isotope Specific Measurements as References (LLTC to the Inorganic Chemistry Division) was hosted by the National Institute of Standards and Technology (NIST), Gaithersburg, USA. The Commission discussed terms of reference and membership and elaborated the first International Measurement Evaluation Programmes (IMEP) using isotope-specific measurements.

The LLTC agreed to start with the IMEP on cadmium in plastics as Swedish legislation has introduced the concept of maximum limits for Cd content in cars as a condition for importation. Austria and Switzerland have taken over — or are about to take over — the same legislation. It is therefore important to evaluate whether Cd-measuring laboratories can accurately determine Cd contents around the concentrations of interest.

The Central Bureau for Nuclear Measurements in Geel, Belgium, has established the reference values for four materials of the programme by means of isotope dilution mass spectrometry (IDMS) using ultimate state-of-the-art knowledge in sample preparation and measurement of the element concerned in the material under investigation. This is done in the framework of one of its primary goals as a measurement institute: providing reliable reference values of measurement with proveable total uncertainties.



NIST, Gaithersburg was the venue of the first meeting of the LLTC on Isotope Specific Measurements as References.

Results will be presented to the Commission at the IUPAC General Assembly in Hamburg.

The next materials for an IMEP round will be trace elements in water and serum.

P. De Bièvre

Profile of the Korean Chemical Society

The IUPAC affiliate membership programme in Korea is operated by the Korean Chemistry Society. This article describes the history, organization and activities of the society.

History

The Korean Chemical Society (KCS) was founded by 53 chemists and chemical engineers in 1946 although, due to turmoil in the country, the first general convention was not held until September 1948. The first issue of *Daehan Hwahak Hwoejee*, the official journal of KCS, was published in 1949.

The activities of KCS were again disrupted by the Korean War that broke out in 1950. However, it managed to publish the second issue of the journal in 1952. The society began publication of its news magazine *Progress in Chemistry and Chemical Industry* in 1961. It joined IUPAC as a regular member in 1963.

In 1971, KCS completed the construction of its present building in Seoul and in the same year held an international convention to celebrate its 25th anniversary. In 1974, it started publication of another journal — *Chemical Education*. Five years later, in 1979, it became a member of the Federation of Asian Chemical Societies (FACS). The following year, KCS commenced publication of the English-language journal *Bulletin of the Korean Chemical Society*.

The society now has about 2500 regular members and 825 student members. It publishes three journals and one magazine (see Box). KCS is one of the largest and most active professional societies in Korea. In 1987, it hosted the Asian Chemical Congress (ASCHEM SEOUL).

KCS periodicals

Journal of the Korean Chemical Society
(bimonthly)

Bulletin of the Korean Chemical Society (printed
in English, bimonthly)

Chemical Education (quarterly)

Progress in Chemistry and Chemical Industry
(monthly)

KCS monographs

Glossary of Korean Chemical Terminology

Korean Nomenclature of Organic Compounds

Korean Nomenclature of Inorganic Compounds

Laboratory Manual General Chemistry

Industrial Chemical Analysis

Directory of Korean Chemists

*Directory of Korean Chemical Manufacturers and
Products*



Korean Chemical Society, Seoul.

Organization

The society is governed by its Central Council which consists of the president, five vice-presidents and presidents of local sections and divisions. The Executive Committee and secretaries assist the president in running the society.

KCS is organized into 11 local sections that operate on a regional basis and eight divisions: organic, inorganic, analytical, physical, industrial, macromolecular, medicinal and biochemical.

Every year, KCS nominates candidates for president. The actual election for presidency takes place by postal ballot. Local sections and divisions elect their councils in similar fashion.

The Secretariat of the society is located in Seoul and at present has four employees. It handles all matters concerning membership, local sections and divisions, relations with government offices, and other national and foreign scientific and technical associations. It also handles subscriptions and the publication of journals.

Membership

KCS membership is open to anyone in the chemical and related sciences — regardless of nationality. There are several classes of membership including group members (libraries, college departments, and companies) and special members (companies and institutions that support the society). These number 95 and 60, respectively.

Annual membership is obtained by paying the annual fee.



KCS officers (from left): Prof. Yong Joon Kim, President; Prof. Hakze Chon, Chairman, International Cooperation Committee; Dr Il Nam Jung, Secretary, International Cooperation Committee.

Activities

KCS holds two general conventions each year — one in Spring and the other in Autumn. These conventions include the presentation of scientific papers. Regional meetings are held on an irregular basis. The divisions of organic, inorganic, analytical, physical, and industrial chemistry hold seminars and symposia throughout the year.

Committee activities include:

- compilation of chemical terminology and nomenclature of chemical compounds;
- enactment of rules for the Korean Industry Standards;
- presentation of lectures and seminars on, for example, industrial chemical analysis and chemical education.

Five monographs have been published as a result of these activities.

Every year, the society gives three awards to chemists who have made distinguished contributions in the previous year: the Award for Advancement of Science; the Award for Advancement of Technology; and the Award for Chemical Education.

The society tries to promote cooperation between academic and industrial chemists. Programmes include special symposia on chemical industry held at the national meetings, training programmes for chemists in industry on chemical analyses, and computer programs for chemists.

KCS international activities are on the increase. The divisions of organic chemistry, inorganic chemistry, and analytical chemistry regularly hold joint Korea–Japan symposia. KCS has been an active member of FACS since 1979 and has nominated Korean representatives to its working groups. KCS has also nominated Korean representatives to the Asian Network for Analytical and Inorganic Chemistry which was established in 1985.

KCS has been a member of IUPAC since 1963 and now belongs to its second category group. In 1986, it was one of the first countries to join the IUPAC affiliate membership programme. There are currently 50 Korean IUPAC affiliate members. The programme is handled by the Committee on International Affairs.

The address of KCS is: The Korean Chemical Society, 35, 5-Ka Anam-Dong, Sungbuk-Ku, Seoul 136-075. Korea. Tel: +82 (2) 926 5457. Fax +82 (2) 923 5589.

Finance Committee Report

Prof. John Ward, Chairman of the Finance Committee, presented the "Report of the Finance Committee: 1989–1991" to Council at the 36th IUPAC General Assembly held in Hamburg, Germany last month. The following is the text of his report.

Introduction

To be constantly effective, an organization needs not only to examine its performance against its objectives from time to time, but it needs also to ensure its continuing financial viability by making projections of its requirements into the years immediately ahead. The Finance Committee, in particular, needs such projections if it is to fulfil the responsibilities laid upon it by the Executive Committee:

1. to advise and make recommendations to the President and Executive Committee on financial matters;
2. to take executive control of the Union's investments.

Four-year Financial Plan

Dr J. Brunner, a Member of the Committee, was the first to recommend that the Union should produce

a 4-year financial plan. A comprehensive plan would require all parts of the Union to forecast their future programmes in detail. Such a plan would entail a substantial effort, and the potential benefits would need to be carefully assessed before it was undertaken. However, the overall programme of the Union does not vary markedly over a 4-year period, and Dr Brunner has produced a financial forecast (Table 1) by making assumptions about future trends, based on general economic projections. It assumes that subscriptions remain static, that investment income is unlikely to increase, and that the supply of money to buy IUPAC publications will remain tight.

Table 1. Financial forecasts (Dr Brunner)
(expressed in units of USD 1000)

		Year				
		91	92	93	94	95
Expenditure	Office	320	352	404	444	488
	IUPAC bodies	630	379	600	455	720
	Other	60	60	60	60	60
	Total	1010	791	1064	959	1268
Income	Subscriptions	510	510	510	510	510
	Interest/ dividends	170	150	150	150	150
	Publications	103	130	130	130	130
	Other	30	30	30	30	30
	Total	813	820	820	820	820
Balance		-197	29	-244	-139	-445

At the same time, I have examined changes over the past 10 years in the principal sources of the Union's income and in its principal cost centres, with a view to extrapolating these into the coming 4 years. Figure 1 shows the trends in income. Dr H. F. Wilson (my predecessor) presented a similar examination to Council at Lund in 1989. I have reworked his figures and have brought them up to date, but using percentage contributions to total expenditure rather than total income, because total expenditure measures the Union's needs for its scientific and other programmes, whereas total income includes the surplus to those needs. Figure 1 confirms the rapid and significant fall-off in the contribution made by subscriptions, from about 80% up to 1982–83 to about 55% in 1987–88 but it shows a levelling off since then, brought about by the decision in 1989 to increase subscriptions. This falling off, combined with a levelling off since 1985–86 of the contributions from the other main sources of income, investments, and sale of publications, is a cause for concern and for urgent remedial action.

Trends in expenditure are shown in Figs 2–4. Figure 2 shows trends in total expenditure, Fig. 3

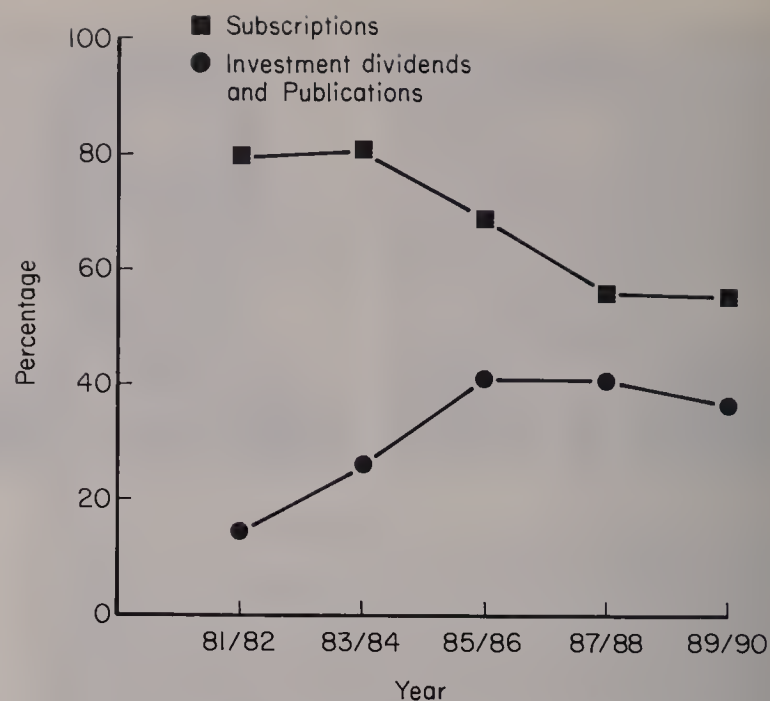


Fig. 1. Income components as a percentage of total expenditure

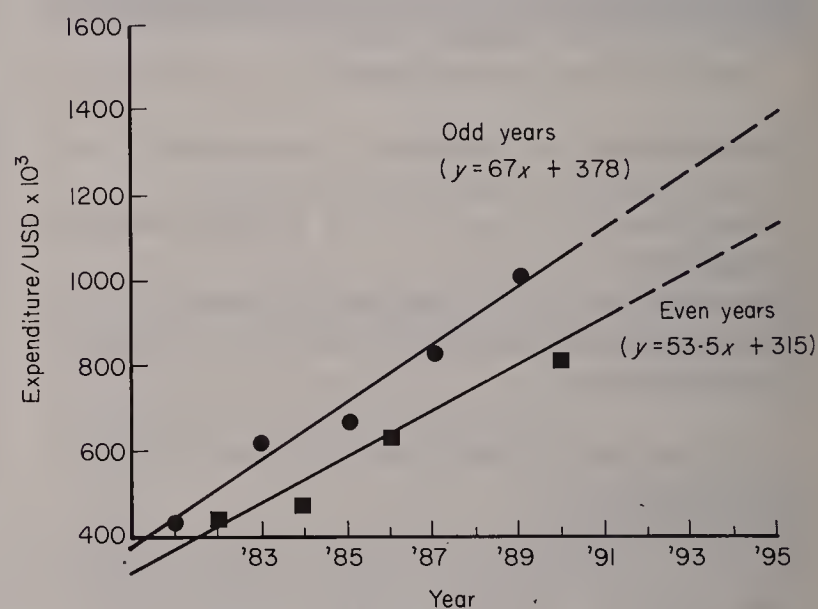


Fig. 2. Total expenditure

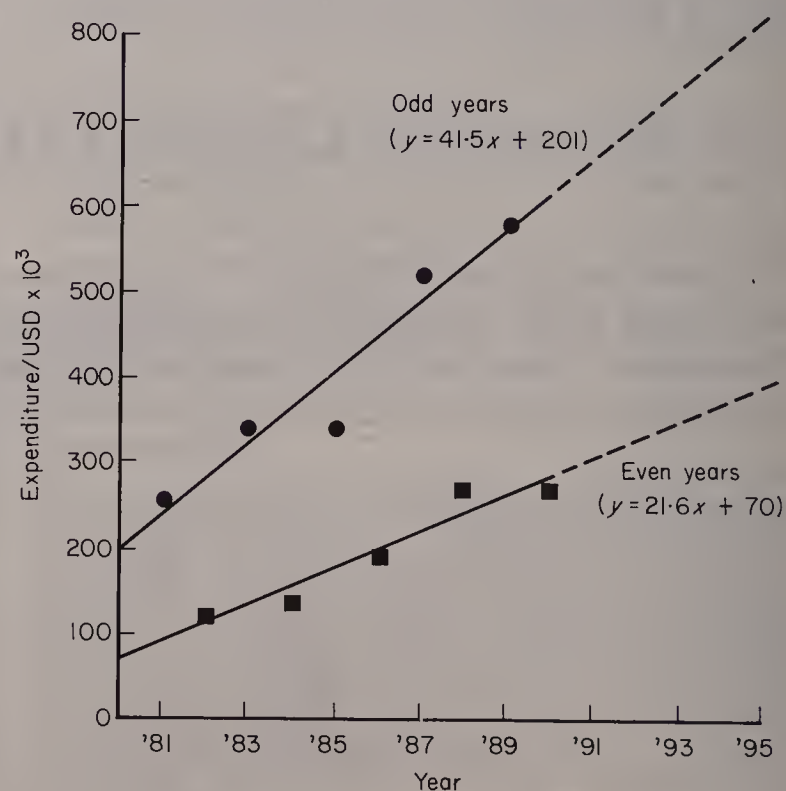


Fig. 3. Expenditure by IUPAC bodies

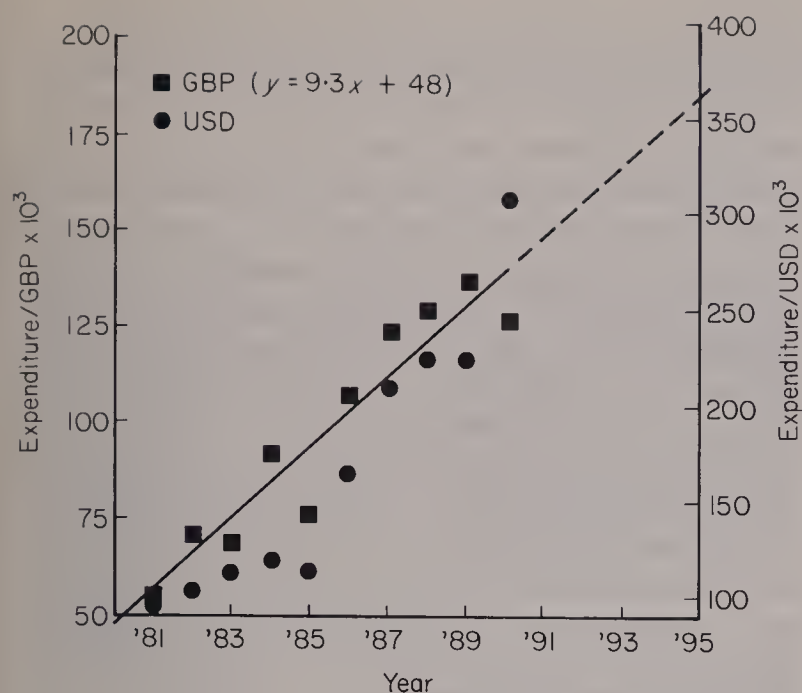


Fig. 4. Expenditure by IUPAC Secretariat

those for expenditure by Committees and Divisions, etc. (IUPAC bodies), and Fig. 4 trends in the cost of the Secretariat. All plots approximate to straight lines: the solid lines in the figures are the calculated regression lines projected forward to 1995. Total balances between the expenditures from Figs 3 and 4 and the income projected from Fig. 1, for the years 1991–95, are given in Table 2, after making minor adjustments to take into account Dr Brunner's methodology. Dr Bunner's figures are also shown.

Table 2. Financial forecasts by extrapolating past trends (expressed in units of USD 1000)

	Year					Total
	91	92	93	94	95	
Expenditure*	1016	857	1150	963	1284	
Income	813	820	820	820	820	
Balance	–203	–37	–330	–143	–464	–1177
Balance ex Table 1	–197	29	–244	–139	–448	–999

*Figures are those taken from regression lines in Fig. 2 but to achieve consistency with Dr Brunner's methodology USD 100 000 has been subtracted — the average provisions given in the accounts 1981–90.

The two sets of annual values are reasonably similar, and the total deficits for the period — USD 1 177 000 and USD 999 000 — are in satisfactory agreement.

Changes in the value of the USD, the currency in which the Union's accounts are denominated, will have a distorting effect on the true trends, but it is not practicable to take them into account except in the case of the Secretariat, the costs of which are met in GBP but are expressed in USD. The rates of exchange for past years have been used to calculate

costs in both currencies (Fig. 4). It can be seen that the rate of increase of true expenditure (GBP) is even, and it is not very different from the rate of increase of other expenditures — unlike the picture presented by the expenditure expressed in USD.

Need for remedial action

Forecasts of any sort rarely match reality, but they are a useful pointer to the way things are likely to go. The Union would be well advised to accept the predictions at their face value and to take remedial action to counter them. If the reality in the next two years shows the prediction to be too pessimistic, or indeed too optimistic, the remedial measures can be adjusted accordingly. In his report, the Treasurer has taken the forecasts, has made modifications in the light of his latest knowledge, and has shown clearly that credible increases in subscriptions cannot alone reduce the deficits. Costs must also be reduced, and he has suggested ways in which these reductions may be made. The Finance Committee supports these suggestions.

Investments

The Union's financial reserves (assets) stood at almost USD 2.5 million at the end of 1990, nearly USD 600 000 above the target value. They have earned an income between USD 170 000 and USD 204 000 for the past 4 years. The financial situation described above means that we shall need to continue to invest for maximum income. This means that the large part of our holdings will be in bonds, together with sufficient short-term investments to give the liquidity needed to meet our fluctuating cash requirements over the biennium.

For several years now we have been fortunate enough to have the advice of Dr A. Hartmann who was, until he retired recently, the chief executive of the Rothschild Bank, Zürich. However, we cannot continue to count on his help indefinitely, and with his advice and agreement we recently concluded an agreement with the Investment Branch of the Union Bank of Switzerland (the IUPAC Banker, Zürich). It will invest on our behalf according to an agreed policy, and subject to regular 3-monthly reviews.

During his Presidency, Prof. Ram Rao proposed that the Union should invest in a building of its own for the Secretariat. I prepared a paper on the subject which was considered by the Executive Committee. It took no immediate action, but decided to keep the proposal in mind. I recommend that the Council agrees to our moving part of the assets into a building fund and adding to it from time to time, in order to provide for the eventuality that the need for a permanent building becomes pressing.

The matters I have reported have been discussed and agreed at meetings of the Finance Committee during the period 1989–90.

Pure and Applied Chemistry (PAC) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Carotenoids in rainbow trout

Xanthophylls such as canthaxanthin, astaxanthin, zeaxanthin, lutein and tunaxanthin that are widely distributed in nature have been found to be precursors of retinoids not only in freshwater fish, such as rainbow trout, and marine fish, such as yellowtail, but also in mammals, for example rats.

'Xanthophylls and precursors of retinoids' was the title of a paper delivered by Takao Matsuno (Kyoto Pharmaceutical University, Japan) at the 9th International Symposium on Carotenoids held in Kyoto on 20–25 May 1990.

Matsuno reported that reductive metabolic pathways (see figure) from 3-dehydroretinol to retinol and from 3-dehydroretinal to retinal have been newly discovered by feeding experiments with rats and yellowtails, respectively.

Matsuno's lecture and other main lectures from the Kyoto symposium were published in the January 1991 issue of *PAC*. They include a lecture by IUPAC affiliate Masayoshi Ito (Kobe Women's

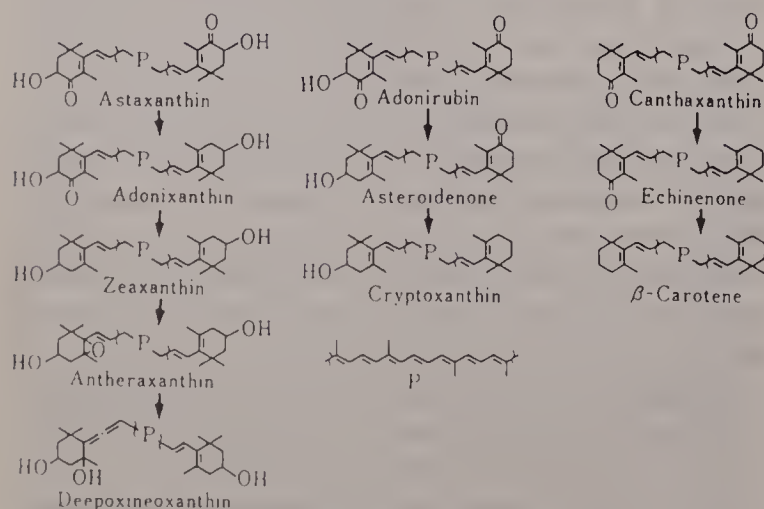
College of Pharmacy, Japan) on 'Recent progress in the synthesis of butenolide carotenoids and retinoids.' In the paper, Ito describes two kinds of method (the Wittig and sulphone methods) for preparing 4-alkylidenebutenolides. An empirical rule regarding the NMR chemical shifts of H-3 in 4-alkylidenebutenolides and displaying an extended conjugated system at the C-2 position is shown. Ito accomplished total synthesis of racemic peridinin and pyrrhoxanthin by means of the sulphone method. Recent work on the synthesis of butenolide retinoids is also described.

Other symposium papers published in this issue of *PAC* include: 'Marine carotenoids: recent progress' (Synnøve Liaaen-Jensen, University of Trondheim-NTH, Norway); 'Separation, identification, and quantification of carotenoids in fruits, vegetables and human plasma by high-performance liquid chromatography' (Frederick Khachik, Gary R. Beecher and Mudlagiri B. Goli, Beltsville Human Nutrition Research Centre and William R. Lusby, Insect and Nematode Hormone Laboratory, Beltsville, Maryland, USA); and 'The biosynthesis of carotenoids: a progress report' (George Britton [symposium editor], University of Liverpool, UK).

Physical organic chemistry

The February 1991 issue of *PAC* contains 12 lectures presented at the 10th International Conference on Physical Organic Chemistry held in the Technion, Israel Institute of Technology, Haifa, 5–10 August 1990.

In the preface to this issue, conference editor Zvi Rappoport (The Hebrew University, Jerusalem) writes that physical organic chemistry is a relatively young sub-field of organic chemistry. It emerged a few decades ago by pioneering studies which applied the methods and theory of physical chemistry to the study, mostly in solution, of organic reactions and their mechanisms. In the years that have elapsed since then, the impact of this new discipline on the way that we practise, understand and teach organic chemistry is enormous. Topics which appeared in the past in special books on physical organic chemistry are now incorporated in elementary organic chemistry textbooks, and computerized information services such as *Chemical Contents* now classify about 30% of the papers published in organic chemistry as belonging to the sub-section of physical organic chemistry.



Reductive metabolic pathways of carotenoids in rainbow trout.

Although the mechanistic study of organic reactions in solution is still one of the main activities of physical organic chemists, the scope of topics which are now regarded in the domain of physical organic chemistry has been greatly expanded in recent years. No longer are only the solutions the reaction media, but reactions in the solid and the gas phases are studied both in their own right and as probes for a better understanding of medium-independent phenomena occurring in solution. The strong tool of computational chemistry now accompanies and frequently precedes and guides the experimental work. Physical organic chemistry contributes significantly to disciplines such as bioorganic chemistry, organometallic chemistry, catalysis and material science.

The program of the Conference as reflected both by the plenary lectures and by the contributed papers, illustrates both the old and the new trends. The opening lecture delivered by J. D. Dunitz, was dedicated to the memory of the late Prof. David Ginsburg, one of the fathers of organic chemistry in Israel and the founder of the chemistry department in the Technion. This lecture discussed the packing of molecules in the crystals in the solid state. Selectivity in electrophilic heteroaromatic substitution, a classical topic of study in solution receives a new dimension through the gas phase and analysis in terms of a curve-crossing reactivity model by M. Speranza. Models for understanding the reactivity and selectivity of organic reactions are in the centre of physical organic studies. The curve-crossing model, which is applicable to a multitude of phenomena, is presented by S. Shaik, whereas two approaches based on computations for the modelling of selectivity in several reactions are discussed by W. J. Hehre and compared with the experimental results.

Reaction intermediates and highly reactive compounds were always of interest to physical organic chemists and their generation and properties are amply represented here. A. J. Kresge describes the recently developed methods for the generation of thermodynamically unstable simple enols, and a study of their classical reactions. O. M. Nefedov illustrates the low-temperature matrix isolation and characterization, for example by infrared spectroscopy, of free radicals, carbenes and silicon analogs and G. Maier presents the isolation of highly reactive and strained compounds by similar methods.

Electron transfer processes have been extensively studied in recent years. The complex mechanisms of N-bromoamide reactions are presented by L. Eberson and electron transfer photoreactions in rearrangements are discussed by T. Miyashi. The role of charge transfer complexes in organic and organometallic chemistry described by J. K. Kochi is an example of the use of fast

Low-temperature IR matrix technique



Professor Oleg Nefedov (Zelinsky Institute of Organic Chemistry, Moscow, USSR) is a Titular Member of the Commission on Physical Organic Chemistry. He presented a lecture on 'Generation, low-temperature stabilization, structure and reactivity of intermediates with low-coordinated carbon, silicon and germanium atoms, at the Haifa Conference.

In his paper, Nefedov described work on the mechanisms of thermal and photochemical transformations of organic and organometallic compounds with the formation of various reactive intermediates, as well as their spectral and structural parameters studied by a low-temperature IR matrix technique.

spectroscopic techniques and of the contribution of physical organic chemistry to organometallic chemistry, which will be a major field for physical organic chemists in the future. Iron porphyrins are such organometallic derivatives and their reactions with dioxygen, including binding and catalytic functions, are presented by T.G. Traylor. The application of classical physical organic chemistry to molecular biology is illustrated by A. R. Fersht in the study of folding of proteins by structuring-activity relationships and kinetics among other techniques.

These papers give the state of art in many sub-topics belonging or adopted by physical organic chemistry.

Boron chemistry

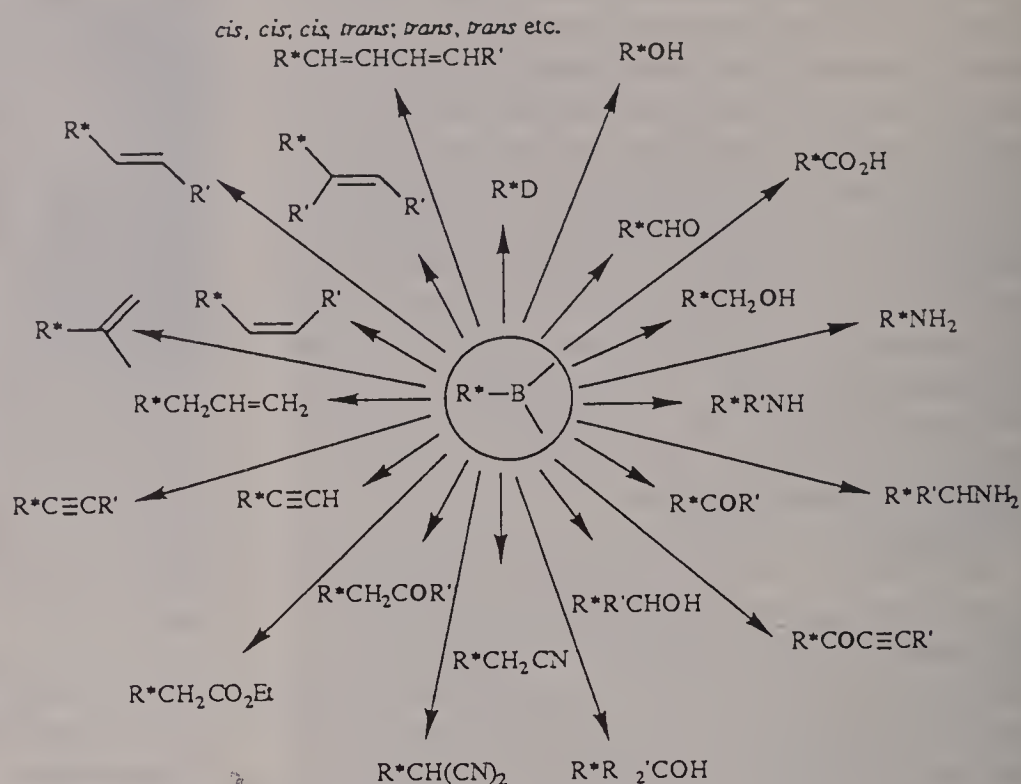
The texts of the plenary and invited lectures presented at the 7th International Symposium on Boron Chemistry (IMEBORON) held in Toruń, Poland, 30 July–3 August 1990 were published in the March 1991 issue of *PAC*.

More than 100 participants from 13 countries attended the meeting, the scientific programme of which consisted of seven plenary and 18 invited lectures, 35 oral and 32 poster presentations. A panel discussion focused on current trends in practical applications of boron compounds.

The boron approach to asymmetric synthesis



Herbert C. Brown.



IUPAC affiliate Herbert C. Brown (Purdue University, USA) won the Nobel Prize for Chemistry in 1979. His paper presented at the Toruń symposium was entitled 'The boron approach to asymmetric synthesis.' The paper was co-authored by P. Veeraraghavan Ramachandran (also at Purdue). In the abstract of the paper published in *PAC*, Brown and Ramachandran write that the unique chemistry of organoboranes has made possible a three-pronged approach to asymmetric synthesis: (1) asymmetric hydroboration, (2) asymmetric reduction, and (3) asymmetric allyl- and crotylboration. Consequently, boron chemistry makes possible not only a uniquely general synthesis of pure enantiomers (with purities approaching 100% ee) as well as more complex stereoisomers by processes that are simple and broadly applicable.

Boron-derived reagents have proven to be exceptionally versatile for the asymmetric reduction of the carbonyl group in a variety of derivatives to give products of optical purities approaching 100% ee. Finally, the synthesis of chiral organoboranes containing allyl, crotyl and related groups attached to boron is providing a highly valuable synthesis *via* allylboration of stereoisomers in purities approaching 100% ee. It is evident that boron chemistry is providing major new routes for asymmetric synthesis in organic chemistry.

The following subjects were covered at the meeting: asymmetric synthesis via organoboranes, polyhedral borane chemistry, boron–nitrogen chemistry, boron-based ceramics, polymers, theoretical and mechanistic studies, enantioselective reductions of organic compounds, coupling reactions, allylic and hindered organoboranes. Biological and medical aspects of boron analogues were strongly emphasized. In addition, Hiroshi Hatanaka, Professor of Neurosurgery at Teikyo University, Tokyo, presented a lecture on the present status of boron-neutron capture therapy of tumours.

IUPAC affiliate Marek Zaidlewicz (Nicolaus Copernicus University, Toruń, Poland) was symposium

editor. Other IUPAC affiliate contributors to the conference included:

Herbert C. Brown (*see Box*):

John J. Eisch (State University of New York at Binghamton, USA) — 'Dia- π -methane-like photo-rearrangements of α,β -unsaturated organoboranes in the synthesis of borirenes and boracarbenoid intermediates'

M. Frederick Hawthorne (The University of California at Los Angeles, USA) — 'Biochemical applications of boron cluster chemistry'

Donald S. Matteson (Washington State University, USA) — 'Recent advances in asymmetric synthesis with boronic esters.'

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

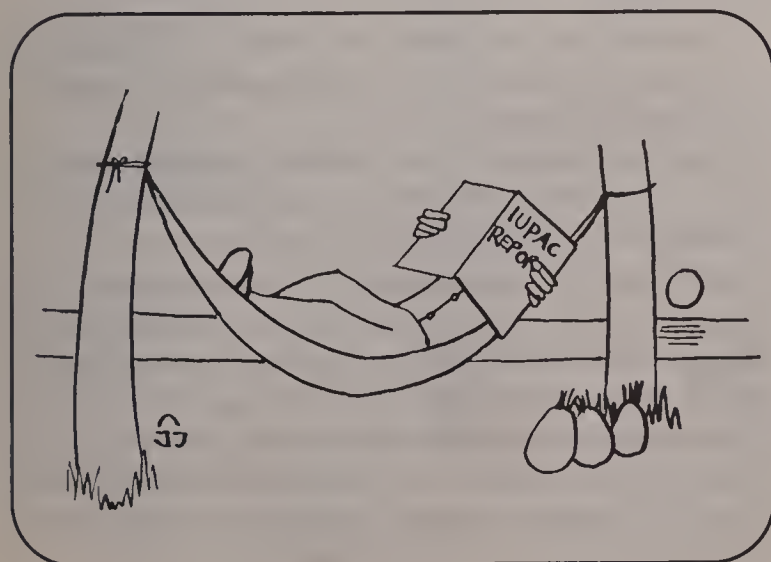
Metal buffers in chemical analysis — Part II: Practical considerations

Metal buffers find various applications in analytical chemistry and in other fields of science and life, but their main use in analytical chemistry has until now been connected with calibration of ion-sensitive electrodes in the low concentration range. Ion-sensitive electrodes in principle measure activity but analytical chemists are mainly interested in concentration and therefore use solutions of known concentration (at constant ionic strength) for the calibration.

The principal requirements of metal buffers are:

- accurately known activities or concentrations of free (hydrated) ions of interest;
- well established correlation between concentration and activity of free (hydrated) ions;
- sufficient metal buffer capacity to eliminate the effect of dilution or changes of the concentration of the ion of interest, due to accidental losses or contamination;
- sufficient pH buffer capacity.

In Part I of this series (see *PAC*, Vol. 59, No. 12, pp. 1681–92, 1987) the theoretical considerations concerning the use of metal buffers in the chemical analysis were given. In this part some practical aspects of the use of metal buffers are discussed, and examples are given where such have been found in the literature.



A metal buffer solution can be defined as a solution for which the pM value is only slightly affected by the addition of the metal ion (M) or the ligand (X) which complexes with the metal ion.

This report was prepared for publication by Adam Hulanicki, Folke Ingman and Erkki Wänninen, Commission on General Aspects of Analytical Chemistry, Analytical Chemistry Division, and published in PAC, Vol. 63, No. 4, pp. 639–42, 1991.

Critical survey of stability constants of complexes of glycine

The contents of this report are as follows:

1. Introduction
 - 1.1 Presentation of equilibrium data
 - 1.2 Data evaluation criteria
2. Proton complexes of glycine
 - 2.1 Protonation constants
 - 2.2 Protonation enthalpies
3. Metal complex stability constants
 - 3.1 Complex formation with group 2A, 3B and 4B metal ions
 - 3.2 Complex formation with group 3d transition metal ions
 - 3.3 Complex formation with group 4d and 5d transition metal ions
 - 3.4 Complex formation with group 4f and 5f metal ions
 - 3.5 Enthalpies accompanying metal complex formation.

This report was prepared for publication by T. Kiss, I. Sóvágó and (the late) A. Gergely, Commission on Equilibrium Data, Analytical Chemistry Division and published in PAC, Vol. 63, No. 4, pp. 597–638, 1991.

Real surface area measurements in electrochemistry

Electrode reaction rates and most double-layer parameters are extensive quantities and have to be referred to the unit area of the interface. Knowledge of the *real* surface area of electrodes is therefore needed. Comparison of experimental data with theories or of experimental results for different materials and/or from different laboratories to each other is physically groundless without normalization to unit *real* area of the electrode surface. Different methods have been proposed to normalize experimental data specifically with solid electrodes. Some of them are not sufficiently justified from a physical point of view. A few of them are definitely questionable.

The purpose of this document is to scrutinize the basis on which the various methods and approaches rest, in order to assess their relevance to the specific electrochemical situation and, as far as possible, their absolute reliability. Methods and approaches are applicable to (a) liquid electrodes, (b) polycrystalline and single crystal face solids and (c) supported, compressed and disperse powders. The applicability of the various techniques to each specific case is to be verified. After an introductory discussion of the 'concept' of real surface area, 15 methods, 11 applied *in situ* and four *ex situ*, are scrutinized. For each of them, after a description of the principles on which it is based, limitations are discussed and recommendations are given.

This report was prepared for publication by S. Trasatti and O. A. Petrii, Commission on Electrochemistry, Physical Chemistry Division, and published in PAC, Vol. 63, No. 5 pp. 711–734, 1991.

Nomenclature, symbols, units and their usage in spectrochemical analysis — VIII. Nomenclature system for X-ray spectroscopy (Recommendations 1991)

This report is one of a series on the nomenclature for spectrochemical analysis issued by IUPAC. It concerns a new notation for X-ray emission lines and absorption edges, to be called *IUPAC notation*, which replaces the existing Siegbahn notation. It is based upon the energy level designation and has the advantage of being simple and easy to apply to any kind of transition. Moreover, it is consistent with the notations used in electron spectroscopy.

The document first discusses the terms currently used in X-ray spectroscopy and then describes the principles of the IUPAC notation with reference to the X-ray levels and the X-ray transitions. The correspondence between Siegbahn and IUPAC notations for all X-ray lines is given in a table. Finally, the document gives the units and conversion factors used in the X-ray range.

This report was prepared for publication by R. Jenkins, R. Manne, R. Robin and C. Senemaud, Commission on Spectrochemical and Other Optical Procedures for Analysis (Analytical Chemistry Division) and published in PAC, Vol. 63, No. 5 pp. 735–746, 1991.

A synopsis of the report was published as Provisional Recommendations in CI, Vol. 9, No. 6, p. 233, 1987. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of April 1988 were taken into consideration when preparing the final report.



An IUPAC report on atmospheric CO₂ concentrations has recently been published.

Assessment of uncertainties in the projected concentrations of carbon dioxide in the atmosphere

The contents of this report are as follows:

- Introduction;
- Recommendations for future research;
- Conclusions regarding uncertainties in sources and sinks;
- Uncertainties in the global carbon cycle (P.P. Tans);
- Assessment of uncertainties in the projected concentrations of CO₂: air-sea exchange (D.R. Turner);
- Uncertainties in biosphere/atmosphere exchanges: CO₂-enhanced growth (J. Goudriaan);
- Uncertainties in dynamics of the biosphere with the accent on deforestation (G. Esser);
- Uncertainties in energy scenarios and their consequences for CO₂ emissions (J. Edmonds);
- National and regional recognition of the greenhouse issue and the consequences thereof in Japan (H. Akimoto);
- Greenhouse effects: actual situation and strategies of the GDR (H-J. Grosse);
- The position of Turkey on the greenhouse issue (U. Özer);
- National and regional recognition of the greenhouse issue and the consequences thereof in China (X. Tang);
- CO₂ emissions from Brazil: assessment of uncertainties, national recognition and consequences thereof (T.M. Tavares).

This report is based on the Proceedings of the International Workshop held at Netherlands Energy Research Foundation, ECN, Petten, Netherlands, 4–6 July 1990 (see CI, Vol. 13, No. 1, pp. 10–14, 1991). It was prepared for publication by J. Slanina and P. Okken, Commission on Atmospheric Chemistry (Applied Chemistry Division) and published in PAC, Vol. 63, No. 5, pp. 763–796, 1991.

Chemistry and the environment

SCOPE Scientific Programme 1990–92

The Scientific Committee on Problems of the Environment (SCOPE) was established by the International Council of Scientific Unions (ICSU) in 1969. SCOPE activities concentrate on environmental problems of global concern.

The committee is very successful in bringing together leading scientists from relevant disciplines for the examination and synthesis of available data and knowledge on selected problems in order to identify serious information gaps. The results of projects are published in a series of SCOPE reports which are reviewed in *CI*. They focus attention on controversial questions, emphasize new approaches, identify research needs and encourage the adoption of sound environmental practices.

SCOPE's current programme includes 23 projects combined in four clusters.

1. Sustainable development cluster

- Phosphorus cycles in terrestrial and aquatic ecosystems and their interaction with the cycles of other elements (Chairman: Prof. C. V. Cole, USA)
- Groundwater contamination (Chairpersons: Prof. C. A. Schoemaker, USA and Prof. A. J. B. Zehnder, The Netherlands)
- Sea level rise and subsiding coastal areas (Chairman: Dr J. Milliman, USA)
- Use of scientific information for sustainable development (Dr A. Khosle, India)
- Biogeochemistry of small catchments (Chairpersons: Dr B. Moldan and Dr J. Cherny, Czechoslovakia)
- Nitrogen transport and transformation – a regional and global analysis (in preparatory phases)
- Sustainable agriculture (in preparatory phases)

2. Biogeochemical cycles cluster

- Trace gas exchange between biosphere and atmosphere (Chairman: Prof. M. O. Andreae, Germany)
- Environmental pathways of artificial radionuclides (Chairman: Prof. Sir F. Warner, UK)
- Sulfur cycles in terrestrial and aquatic systems (Chairman: Prof. M. V. Ivanov, USSR)
- Heavy metals cycling (Chairman: Prof. T. C. Hutchison, Canada)
- Particle flux in the ocean (Chairman: Dr S. Kempe, Germany)

- Interaction of the cycles of main elements in intercontinental seas (in preparatory phase)

3. Global change and ecosystem cluster

- Organic matter budgets (Chairpersons: Prof. A. Breymeyer, Poland, and Dr J. M. Melillo, USA)
- Ecotones in a changing environment (Chairman: Prof. P. G. Risser, USA)
- Ecosystem experiments (Chairman: Prof. H. A. Mooney, USA)
- Long-term ecological research (Chairman: Prof. P. G. Risser, USA)
- Effects of increased UV radiation on biological systems (Chairman: Dr E. De Fabo, USA)
- Genetically modified organisms (Chairman to be appointed)
- Biodiversity (in preparatory phase)

4. Health and ecotoxicology cluster

- Ecotoxicology (Chairman to be appointed)
- Safety of chemicals – SCOMSEC (Chairman: Prof. Ph. Bourdeau, Belgium)
- Health effects of climate change (in preparatory phase)

According to Prof. Valentin Koptug, Chief Coordinator of the IUPAC Chemistry and the Environment Programme (CEP), the SCOPE programme overlaps to a certain extent with the CEP sphere of interest. He therefore considers it desirable to seek acceptable forms of collaboration in mutually interesting areas. Koptug suggests that IUPAC bodies should pay particular attention to projects 1a, 1d, 2a, 2b, 2d, 3e, 4a and 4b. Accordingly, he invites, on behalf of the CEP Coordinating Committee, members of the appropriate bodies to submit proposals – through the IUPAC Secretariat.



One of the new projects in the SCOPE Biogeochemical cycles cluster concerns the interaction of the cycles of main elements in intercontinental seas.

Understanding radiation

Radiation, both in its connection with nuclear power and its medical and industrial uses, is one of the most emotive and frequently misunderstood subjects. To help inform the public, the United Kingdom Atomic Energy Authority has produced a new booklet which explains radiation, its dangers and benefits.

Radiation, effects and control describes the different types of radiation, the effects of exposure — to both natural sources such as radon and man-made sources — and its benefits to medicine and industry. The booklet also explains the measures taken to protect those who work with radioactive materials.

Copies of the booklet are available, free of charge, from: Information, B465 Harwell, Didcot, Oxfordshire, OX11 0RA, UK or by telephoning +44 (235) 435731.



Radioisotopes are used to produce images of combustion chambers in jet engines. (Photo courtesy of UKAEA.)

Cleaner production programme

Over the past 10–15 years, progress in the development of cleaner production technologies has been impressive.

In order to organize the collection and dissemination of information which can play an important role in the solution of environmental problems of industry, the Industry and Environment Office (IEO) of the United Nations Environment Programme (UNEP) has launched its Cleaner Production Programme. The main goal of this programme is the creation of an international network for promotion of the use of low-level and zero waste technologies with the motto 'to produce more but pollute less'.

UNEP/IEO has formed a set of working groups on various branches of industry (the electroplating, textile, leather, pulp and paper, and petroleum industries) as well as working groups on harmonization of information and on government policies and strategies to promote cleaner production.

Two main ways are foreseen for dissemination of the information collected. First of all, UNEP/IEO has established a newsletter entitled *Cleaner Production* which is to be a regular supplement to their magazine *Industry and Environment*. The first two issues of the newsletter were published, respectively, in April and August last year.

The second method of dissemination involves a computer-based information exchange system: International Cleaner Production Information Clearinghouse (ICPIC). This is being tested for user access by direct-dial telephone lines. The system is based mainly on the US Pollution Prevention Information Clearinghouse (PPIC, EPA, USA). It contains hundreds of cleaner-technology documents, a description of international programme on low-level and zero-waste technologies and a calendar of training events and seminars.

The purpose of this system is to act as a 'pointer' providing basic descriptive information on clean production processes with indication of sources for more detailed information (for example, companies, research and academic organizations, technical institutions, and networks).

For more information, please contact: UNEP/IEO, 39–43 Quai Andre Citroen, 75739 Paris Cedex 15, France. Tel: +33 (1) 40 58 88 50. Fax: +33 (1) 40 58 88 74. Telex: 204 997 F.

Environmental Health Criteria

The *Environmental Health Criteria* series is published under the joint sponsorship of the United Nations Environment Programme (UNEP), the International Labour Organization (ILO) and the World Health Organization (WHO). There are now 115 titles in the series. Report Nos 1–86 were reviewed in the September 1990 issue of *CI* (pages 197–201) and Nos 87–101 listed in the March 1991 issue (pages 68–69). Report Nos 102–115 are listed below. Report Nos 88, 90, 94–6, 100 and 115 are also reviewed.

102. 1-Propanol
103. 2-Propanol
104. Principles for the toxicological assessment of pesticide residues in food
105. Mycotoxins
106. Beryllium
107. Barium
108. Nickel
109. Summary report on the evaluation of short-term tests for carcinogens (Collaborative study on *in vivo* tests
110. Tricresyl phosphate
111. Triphenyl phosphate
112. Tributyl phosphate
113. Fully halogenated chlorofluorocarbons
114. Dimethylformamide
115. 2-Methoxyethanol, 2-ethoxyethanol, and their acetates.

Polychlorinated dibenzo-*para*-dioxins and dibenzofurans

Environmental Health Criteria, No. 88, Published by WHO, 1989, 409 pp. (English only), ISBN 92 4 154288 8. CHF 40.-/USD 32.00; in developing countries CHF 28.-. Order No. 1160088.

Polychlorinated dibenzo-*para*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are two series of tricyclic compounds with similar chemical and physical properties. These compounds, which are not produced intentionally, are formed as an undesired side reaction during the manufacture of a number of chemical products used extensively as insecticides, herbicides, fungicides, mold inhibitors, antiseptics, disinfectants, and wood preservatives. These compounds are also unintentionally formed during a variety of incineration reactions involving the burning of municipal wastes, hazardous wastes, hospital wastes and sewage sludge and during accidental fires involving polychlorinated biphenyls.

This report evaluates the risks to human health and the environment posed by exposure to these highly toxic compounds. More than 800 studies were critically assessed. The methodological problems facing investigators emerge in the opening section, which outlines the highly complex sampling and analytical procedures required to perform meaningful evaluations of the chemistry of PCDDs and PCDFs.

A section devoted to sources of environmental pollution traces most of the presence of these compounds in the environment to the use of contaminated chemicals and, most notably, to products prepared from 2,4,5-trichlorophenol. Particular attention is given to incidents of heavy environmental pollution resulting from industrial accidents, as occurred at a factory near Seveso in Northern Italy, from improper disposal of industrial waste, as occurred in Missouri and in Love Canal, USA, and from the heavy use of contaminated chemicals, as occurred at a US Air Force base during the testing of aerial spraying equipment for military defoliation operations using Agent Orange.

Other sections review data on the behavior of these compounds in the environment, sources of human exposure, and metabolic behaviour in organs and tissues. On the basis of this review, the report concludes that although ubiquitous in the environment, PCDDs and PCDFs occur in very low levels and that exposure of the general population occurs mainly through the food-chain.

The greatest part of the book evaluates the extensive body of data linking these compounds, and especially the PCDD 2,3,7,8-tetrachloro-dibenzo-*p*-dioxin, to adverse effects on health. Although effects vary greatly in different animal species, the report notes the striking similarity

between the consequences of poisoning, including failure of normal growth, keratosis, epithelial lesions, immunosuppression and reproductive and teratological effects, and the effects of vitamin A deficiency observed in humans.

The assessment of effects on human health draws upon studies following industrial accidents, mass outbreaks of poisoning caused by consumption of contaminated rice oil in Japan and Taiwan, and the widespread use of contaminated Agent Orange in Vietnam. Despite the number of clinical and follow-up studies, and despite the high incidence of hepatocellular carcinoma observed in some animal species, the report concludes that, for occupational and accidental exposures, no clear-cut persistent systemic effects other than chloracne have been observed. Uncertainties related to the real dose received by humans and the difficulty of assessing toxic effects other than chloracne in humans prevent a firm conclusion as to the relative resistance of humans to the toxic effects of these compounds.

Dimethoate

Environmental Health Criteria, No. 90, Published by WHO, 1989, 85 pp. (English only), ISBN 92 4 154290 X CHF 12.-/USD 9.60. Order No. 1160090.

This book evaluates the risks to human health and the environment posed by dimethoate, an organophosphorus insecticide widely produced and used to control a range of insects and mites. Dimethoate formulations are applied on numerous crops, including those grown in greenhouses, and used for the indoor control of houseflies.

The book opens with information on physical and chemical properties and methods used for detection and analysis. Other sections describe the sources of human and environmental exposure, explain the behaviour of dimethoate in the environment, and summarize what is known about the mechanisms by which this insecticide exerts its toxic effects.



Dimethoate is an organophosphorus insecticide widely used to control a range of insects and mites.

Concerning sources of occupational exposure, an effort is made to define the minimum safe re-entry periods following spraying in greenhouses, and after outdoor application by tractor or plane. A review of the effects of dimethoate formulations on organisms notes the low risk to farm animals, the moderate toxicity for birds, fish, and aquatic organisms, and the very high toxicity for honey bees.

The most extensive section reviews the design and findings of experimental studies useful in assessing adverse effects on human health. Health risk are further defined through a review of case studies of accidental and suicidal poisoning and of poisoning following occupation exposures. The book concludes that, when dimethoate is used under proper conditions, exposure of the general population through air, food, or water is negligible. Concerning occupational hazards, exposure during the manufacture, formulation, use, and disposal of dimethoate does not pose an unacceptable human health hazard, provided appropriate safety precautions are observed.

Permethrin

Environmental Health Criteria, No. 94, Published by WHO, 1990, 125pp. (English only), ISBN 92 4 154294 2. CHF 15.-/USD 12.00; in developing countries CHF 10.50. Order No. 1160094.

This book evaluates the design and findings of over 250 studies concerned with the effects on human health and the environment posed by permethrin, a photostable synthetic pyrethroid insecticide marketed since 1977. Because of its strong repellent properties and effectiveness as a stomach and contact insecticide, permethrin is widely used in the protection of several agricultural crops, in the control of insects in households and on cattle, in aerial application for forest pest control, as a fog in mushroom houses, and as a wood preservative. Public health applications include the disinfection of aircraft, treatment of mosquito nets, and human lice control.

The opening section describes the properties of permethrin and identifies the most appropriate methods for residue and environmental analysis. In view of the uses of permethrin and its photostable properties, a section devoted to sources of human exposure concentrates on the large number of studies investigating residues in fruits, vegetables, dairy milk, and grains. Other sections review findings on the environmental behaviour of permethrin, its metabolic pathways in mammals, and its effects on non-target organisms. Findings from laboratory studies, indicating that permethrin is highly toxic to certain beneficial insects and natural enemies of pests, are contrasted with field investigations demonstrating the transitory nature

of most toxic and repellent effects on non-target species.

The most extensive section reviews the findings of experimental studies conducted to assess toxicity, primary irritation, sensitization, long-term toxicity, carcinogenicity, mutagenicity, teratogenicity, neurotoxicity, and behavioural effects. Particular attention is given to differences in study design, dose, and mode of administration that can affect the validity of findings when extrapolated to humans. The final section draws upon a limited number of occupational and clinical studies to evaluate direct evidence of adverse effects on health.

On the basis of this review, the book concludes that most toxic effects are transitory, that the likelihood of carcinogenic effects in humans is extremely low or non-existent, and that permethrin, when used as recommended, is not likely to present a hazard to the general public, exposed workers, or the environment.

Fenvalerate

Environmental Health Criteria, No. 95, Published by WHO, 1990, 121 pp. (English only), ISBN 92 4 154295 0. CHF 15.-/USD 12.00; in developing countries CHF 10.50. Order No. 1160095.

This book evaluates the risks to human health and the environment posed by fenvalerate, a synthetic pyrethroid insecticide widely used for crop protection. Marketed since 1976, fenvalerate is also used in homes and gardens and for the control of insect infestation in cattle.

The opening section describes the properties of fenvalerate and identifies appropriate methods for environmental sampling and the analysis of residues. A brief discussion of sources of human exposure concentrates on studies of dietary residues, concluding that residues in crops grown by good agricultural practice are generally low. A



Fenvalerate is a synthetic pyrethroid insecticide. It is to control insect infestation in cattle and to protect crops.

section devoted to environmental behaviour cites studies documenting the rapid degradation and decomposition of fenvalerate, the reduced toxicity of its degradation products, and the absence of leaching in soil. Other sections outline metabolic pathways and summarize studies of effects on aquatic and terrestrial organisms, including investigations of uptake, loss, and bioaccumulation. Although laboratory tests have demonstrated high toxicity for fish and honey bees, these effects are shown to be markedly reduced under field conditions, where toxicity is mitigated by the adsorption of the compound to sediments and its strong repellent effect.

The remaining sections evaluate effects on health as determined from the results of animal experimentation, *in-vitro* tests, case studies of accidental exposure, and clinical investigations. On the basis of this review, the book concludes that exposure of the general population is very low, that the effects of occupational exposure are transitory, and that risks to the environment and human health are unlikely when fenvalerate is applied as recommended.

d-Phenothrin

Environmental Health Criteria, No. 96, Published by WHO, 1990, 64 pp. (English only), ISBN 92 4 154296 9. CHF 10.-/USD 8.00; in developing countries CHF 7.-. Order No. 1160096.

This book evaluates the risks to human health and the environment posed by d-phenothrin, a synthetic pyrethroid insecticide used primarily for the household control of noxious insects, including head lice, and for the postharvest treatment of stored grain.

Following concise information on properties and methods of sampling and analysis, the book reviews available data on the world-wide industrial production and use and summarizes studies conducted to assess residues in stored grain. A section devoted to the behaviour of d-phenothrin in the environment concentrates on investigations of photodegradation and transport, concluding that photodegradation under outdoor conditions is rapid, but that d-phenothrin remains virtually intact for up to 12 months on grains stored in the dark. Other sections summarize the pathways by which d-phenothrin is metabolized in mammals and review the limited data available on effects on aquatic and non-target terrestrial organisms.

The most extensive section evaluates toxicological data from studies in experimental animals and *in-vitro* test systems, concentrating on investigations performed to assess embryotoxicity, teratogenicity, and neurotoxicity. The evaluation confirms a low toxicity for d-phenothrin and an absence of mutagenic, teratogenic, embryotoxic, oncogenic

and neurotoxic effects observed in the animals and systems investigated. Concerning effects on human health, the book notes that d-phenothrin has not, during more than a decade of use, been reported to have caused human poisoning or toxic effects in humans.

On the basis of these evaluations, the book concludes that d-phenothrin, when used as recommended, is not likely to pose a hazard to either human health or the environment.

Vinylidene chloride

Environmental Health Criteria, No. 100, Published by WHO, 1990, 1987 pp. (English only), ISBN 92 4 154300 0. CHF 20.-/USD 16.00; in developing countries CHF 14.-. Order No. 1160100.



Vinylidene chloride has a variety of applications including its use for food packaging. Although the general population is exposed to very low levels of this substance long-term occupational exposure warrant special precautions.

Vinylidene chloride is a volatile, colourless liquid used for the production of 1,1,1-trichloroethane and to form modacrylic fibres and copolymers. Vinylidene chloride/vinyl chloride copolymers are used for the packing of foods, as metal coatings in storage tanks, building structures, and tapes, and as moulded filters, valves, and pipe fittings. Food packaging applications include both commercial packaging films and household wraps.

This book evaluates the complete body of scientific evidence useful in defining the specific environmental hazards and risks to human health posed by the production and use of vinylidene chloride. Opening sections cover chemical properties, routes of release into the environment, environmental fate, sources of occupational exposure, and exposure of the general public, mainly through air, tap water, and food. Mechanisms of absorption and metabolic routes in animals and in humans are also clearly defined.

The most extensive sections evaluate the design and findings of studies, in experimental animals and *in-vitro* test systems, attempting to link exposure to specific health hazards. Research, including studies of possible carcinogenic and mutagenic effects, indicates that the main health hazards associated with exposure are irritation of the skin and eye and depressed functions of the central nervous system.

The report concludes that the general population is exposed to very low levels of this chemical, that risks associated with long-term occupational exposure warrant special precautions, and that an evaluation of carcinogenic risk to humans must await further epidemiological studies. The release of vinylidene chloride into the atmosphere is not considered likely to contribute to the depletion of the stratospheric ozone layer.

2-Methoxyethanol, 2-ethoxyethanol, and their acetates

Environmental Health Criteria, No. 115, Published by WHO, 1990, 126 pp. (English only), ISBN 92 4 157115 2. CHF 15.-/USD 12.00; in developing countries CHF 10.50. Order No. 1160144.

This book evaluates the risks to human health and the environment posed by exposure to 2-methoxyethanol, 2-ethoxyethanol, and their two acetates: 2-methoxyethyl acetate and 2-ethoxyethyl acetate. These glycol ethers have a wide range of uses as solvents with particular application in paints, stains, inks, lacquers, and the production of food-contact plastics. Glycol ethers are also used as resin solvents, as solvents for dyes in textile and leather finishing, and as general solvents in a wide variety of home and industrial cleaners. 2-methoxyethanol is used extensively as an anti-icing additive in hydraulic fluids and jet fuel.

The book opens with a brief introduction to the physical and chemical properties of these com-

pounds and the analytical methods available for their detection. Sections concerned with sources of exposure note that patterns of use as evaporative solvents result in significant, widespread emissions to the environment, with great potential for direct human exposure in industry, in small work-shops, and during home use of numerous consumer products. A review of data on environmental behaviour points to rapid degradation, supporting the conclusions that the risk of hazardous environmental concentrations is small and that human exposure through food, water, or the ambient air is probably negligible. Other observations include the importance of dermal absorption as a route of human exposure and the similarity of the mechanisms of toxicity observed in both humans and experimental animal species.

A review of experimental studies of toxicity reveals strong and consistent evidence, across all species investigated, of adverse effects on the male reproductive system, developmental toxicity, and haematological toxicity. Although studies in humans are scarce, results from case reports and workplace epidemiological studies confirm the findings from animal research, pointing to a clear risk of disturbances in the male reproductive system and of embryotoxicity. In view of the prolonged retention of these compounds by humans, the report suggests that humans may be more vulnerable to toxicity than the most sensitive laboratory species.

The book concludes with a series of recommendations to authorities, including the need to find less toxic solvents, to alert users to the hazards of these chemicals, and to be aware that, because of especially rapid dermal absorption, air monitoring alone is not an adequate measure of safety conditions at the workplace. A final series of recommendations points to the need for further research in seven specific areas.

Publications

Fluorine thermodynamic tables

Volume 11 of the *International Thermodynamic Tables of the Fluid State* is concerned with fluorine. The volume is edited by Mrs K. M. de Reuck (IUPAC Thermodynamic Tables Project Centre, Imperial College, London, UK).

The Thermodynamic Tables Project was inaugurated in 1963 by the Commission on Thermodynamics and Thermochemistry of the Physical Chemistry Division with the object of compiling internatio-

nally agreed values of the equilibrium thermodynamic properties of liquids and gases of interest to both scientists and technologists. The range to be covered for each fluid is that for which reliable experimental data exist, and the agreed values are issued as tables upon the basis of which users may produce equations suited to their own special requirements, if the wide-ranging equations given are not appropriate for their purposes. The following tables have already appeared based on these principles:



Hunterston 'A' and 'B' Nuclear Power Stations in Ayrshire, Scotland: elemental fluorine is used in the nuclear power industry for the production of uranium hexafluoride which is needed for the separation of uranium isotopes by gaseous diffusion. (Photo courtesy of UKAEA.)

- Vol. 1. *Argon*, 1971. Butterworth, London (1972).
- Vol. 3. *Carbon Dioxide*. Pergamon Press, Oxford (1976)
- Vol. 4. *Helium-4*. Pergamon Press, Oxford (1977).
- Vol. 5. *Methane*. Pergamon Press, Oxford (1978).
- Vol. 6. *Nitrogen*. Pergamon Press, Oxford (1979).
- Vol. 7. *Propylene (Propene)*. Pergamon Press, Oxford (1980)
- Vol. 9. *Oxygen*, Blackwell Scientific Publications, Oxford (1987)
- Vol. 10. *Ethylene (Ethene)*. Blackwell Scientific Publications, Oxford (1988).

Volume 10 on Ethylene (Ethene) replaces Volume 2 which was published by Butterworths in 1974. The present volume on fluorine is the next in this series.

For important fluids for which the existing data are inadequate to form the basis of extensive tables using the above criteria, a combination of experimental data and estimation is used to construct 'tentative' tables. The following volume was the first to appear in this series:

- Vol. 8. *Chlorine Tentative Tables*. Pergamon Press, Oxford (1985).

Fluorine gas was first isolated just over 100 years ago by Henri Moissan in 1886. Because of the comparatively weak bond which holds the two atoms together, fluorine is an extremely reactive element; it is also highly toxic and very dangerous. In the 1960s it was used as a propellant oxidizer in rocket propulsion systems and a major programme of experimental measurement was carried out at the National Bureau of Standards in Boulder. This work resulted in the publication, in the early 1970s, of an extensive set of thermodynamic tables. These were based on several separate equations fitted to the

data in different regions; the authors had been unable to correlate the data into a single equation of state to cover the whole experimental region. As fluorine is the only member of the halogens for which there is an extensive set of data it was thought that the development of an equation of state to represent the whole fluid surface would be a useful addition to the IUPAC series. The most widely used halogen is chlorine, for which the available experimental data are so limited that the tables for this fluid published in this series had to be prepared mainly from predicted data.

One of the main current uses for elemental fluorine is in the nuclear power industry for the production of uranium hexafluoride which is needed for the separation, by gaseous diffusion, of ^{235}U from ^{238}U . An expanding use is in the manufacture of sulfur hexafluoride which is widely used in the power generation and distribution industries as an insulator in gas-filled circuit breakers and as the main insulation for power transmission in high-voltage co-axial cables. A new use is in the development of a high-powered laser which burns hydrogen and fluorine gas to form hot hydrogen fluoride molecules which emit infra-red light at a wavelength of $2.7\text{ }\mu\text{m}$.

Thermodynamic consistency between the various properties which are given in the tables of this book is assured if the available data are used to construct an equation of state from which all the other properties can be evaluated by mathematical manipulation. The most convenient independent function to use is the Helmholtz energy and so the appropriate independent variables are density and temperature. The dimensionless function selected for use in this book is a reduced Helmholtz energy, $A/(RT)$, represented by

$$\frac{A}{RT} = \alpha(\omega, \tau) + \ln(\omega/\omega_a) + \alpha^{id}(\tau).$$

The dimensionless density and temperature variables are ω and τ ; α is a function which represents the behaviour of the real fluid, and the ideal gas is represented by α^{id} together with the logarithmic term. As there is no absolute scale of Helmholtz energy an arbitrary reference state has been taken as the point (ω_a, τ_a) in the ideal gas where S^{id} and H^{id} are both set to zero. All other thermodynamic properties which are tabulated in the main tables of this book can be derived from this single equation by differentiation alone.

The major portion of Section 1 of the text of this book is concerned with a discussion of the available data and the accuracy with which they are represented by the equation of state. Section 2 contains a description of the construction of the equation of state. For the convenience of users who are only interested in restricted states of the fluid, a number of auxiliary equations are given in Section 3. These include equations for the vapour pressure, the sublimation pressures and the density-temperature relations of the saturated liquid and vapour; separate equations for the temperature dependence on the isobaric heat capacity, entropy and enthalpy of the ideal gas; and an equation which represents the behaviour of the gas phase. Section 4 explains how the tabulated properties were calculated from the equation of state and gives tabulations of the derived functions in order to assist those who wish to prepare computer programs for them.

The properties tabulated in the tables of this book are the volume, entropy, enthalpy, isobaric heat capacity, compression factor, fugacity/pressure ratio, Joule-Thomson coefficient, ratio of the heat capacities and speed of sound as functions of pressure and temperature; also the pressure, entropy, internal energy and isochoric heat capacity as functions of density and temperature for the gas and liquid states from 0.025 to 20 MPa at temperatures from 54 K to 300 K. Zero-pressure tables are given, as are tables of the properties of the fluid phases along the saturation curve and the melting curve.

The equation of state which has been used to calculate the tables in this book has been included in the Imperial College Equations of State Computer Package.

The above description is taken from the Preface and Introduction of Fluorine: International Thermodynamic Tables of the Fluid State — 11 edited by K. M. de Reuck and was published by Blackwell Scientific Publications Ltd, Oxford, UK, 1990. xviii + 193 pp. ISBN 0-632-02871-8. Price: GBP 27.50/USD 51.00; Affiliate Members Discount Price: GBP 20.50/USD 38.25.

Drugs in competitive athletics

The increasing awareness of the use of performance-enhancing drugs in competitive athletics prompted the IUPAC Commission on Toxicology (VII.4) to arrange an international conference devoted to analytical and clinical aspects of this problem.

The resultant 1st International Symposium on Drugs in Competitive Athletics was held on the Islands of Brioni, Yugoslavia on 29 May–2 June 1988. The meeting was attended by participants from 19 countries and included plenary lectures and contributed papers by many of the world's authorities on this subject.

The meeting also included open forum discussions on drug testing at major athletic events, with the panel members including the principal organizers of the drug testing for the Olympic Games held in Montreal (1976), Sarajevo (1984), Los Angeles (1984) and Universiade '87 Zagreb.

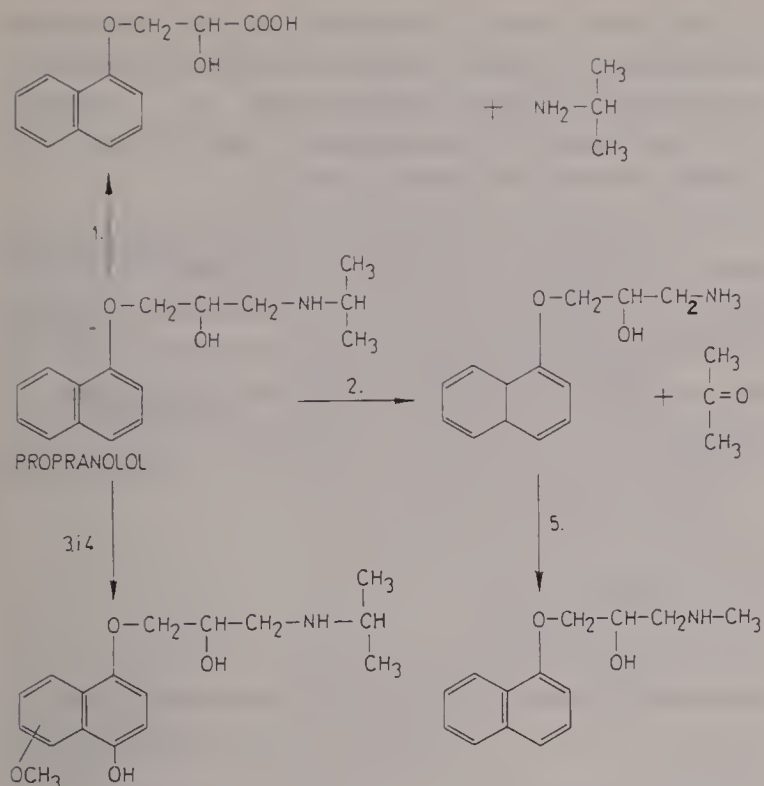


'Regular checking of sportsmen at all levels of competition' was one of the topics at the Brioni symposium.

Drugs in Competitive Athletics contains the synopses of the open forum discussions and the following scientific papers presented at the symposium:

1. Analytical testing

- Methodological imperatives and analytical requirements for the detection and identification of drugs misused in sport;
- Endocrine effects and immunoassay procedures of anabolics;
- Detection of the administration of natural androgens;
- The detection of synthetic and natural corticosteroids;
- The potential applications of an androgenic receptor assay for anabolic steroid screening;
- Potential of HPLC for screening and confirmation of diuretics;
- Identification of drug metabolites by gas chromatography — mass spectrometry;
- Mass spectrometry instrumentation in the 1990s;



This scheme of metabolic pathways of propranolol was one of the illustrations used by Slobodan Rendić (University of Zagreb, Yugoslavia) in his paper 'Identification of drug metabolites by gas chromatography-mass spectrometry.' Propranolol is one of the betablockers on the list of prohibited substances issued by the International Olympic Committee in 1985.

- Drug testing in baseball;
- Doping in Italy;
- Regular checking of sportsmen at all levels of competition;
- Vitakrom-TMN, new phase for the gas chromatography of stimulants in doping control;
- Identification of pemoline in urine.

2. Health effects

- Health risks of steroid use;
- Potential role of synthetic sex steroids in hepatocarcinogenesis;
- Potentiating effect of carnitine on the *in vitro* methacholine-induced relaxation of masseteric arteries;
- Changes of liver, testicles and muscles of experimental animals at training, affected by anabolic steroids;
- Effects of anabolizing androgen on hepatic monooxygenase activities;
- Effect of fluoxymesterone administration on adrenal steroidogenesis in dependence of the sex.

Drugs in Competitives athletics: Proceedings of the 1st International Symposium, Yugoslavia, 1988, is edited by James R. Shipe, Jr. and John Savory and published by Blackwell Scientific Publications, Oxford, UK, 1991. v + 139 pp. ISBN 0-632-03181-6. Price: GBP 19.50/USD 37.00 (less 25% for affiliate members).

ENTVAPOR

ENTVAPOR is a new IUPAC database published by Blackwell Scientific Publications. It is a retrieval and computation system that makes available enthalpies of vaporization of organic compounds.

The computations are based on recommended values of enthalpies of vaporization established at the Institute of Chemical Technology in Prague during a project of the IUPAC Subcommittee on Thermodynamic Tables. Recommended values were obtained by evaluation of all available experimental (calorimetric) enthalpies of vaporization for organic compounds; no data derived from vapor pressure measurements or chromatographic determinations were considered. These recommended values are found in Volume 32 of the IUPAC Chemical Data Series *Enthalpies of Vaporisation of Organic Compounds, Critical Review and Data Compilation* by Vladimír Majer and Václav Svoboda and published by Blackwell Scientific Publications in 1985.

The ENTVAPOR system allows users to go far beyond this compilation by giving reliable temperature extrapolations of enthalpies and entropies of vaporization beyond the range of experimental values for over 600 organic compounds. Thus, even for compounds where experimental values were reported at only one temperature, a calculation over a wide temperature range can be performed quickly and easily.

ENTVAPOR is available in both 3.5- and 5.25-inch diskettes. The program is distributed as an executable file which can be run under MS-DOS or PC-DOS on IBM-PC-compatible computers with at least 512K of RAM.

ENTVAPOR is available from Blackwell Scientific Publications Ltd, PO Box 88, Oxford, UK. The US Office is c/o PBS, PO Box 447, Brookline Village, MA 02147. The cost of the system, including user manual, is USD 150. IUPAC affiliates can receive the system for USD 112.50.

Specifications for pharmaceutical preparations

WHO Expert Committee on Specifications for Pharmaceutical Preparations, 31st Report, published by the World Health Organization contains the recommendations and conclusions of an expert committee concerned with the need to assist drug control laboratories and regulatory authorities in the quality control of pharmaceutical preparations.

The report is an outgrowth of WHO efforts to extend continuous advice on the laboratory facilities, analytical procedures, and systems of control needed to assure the quality and safety of essential drugs.

The book has two main parts. The first serves as a brief alert to a number of technical developments and practical problems pertinent to the operation of quality control laboratories. Topics discussed include the quality assurance of products manufactured by recombinant DNA technology, the inability of stability data compiled in temperate countries to predict shelf-life in tropical climates, and the special problems created by falsely labelled, spurious, counterfeited, and substandard pharmaceuticals.

Readers are also given a report on the progress of several ongoing WHO programmes, including basic tests for use in the *International Pharmacopoeia*, additions to the International Chemical Reference Substances and infrared reference spectra, and the WHO Certification Scheme on the Quality of Pharmaceutical Products Moving in International Commerce.

The second and most extensive part consists of a series of annexes offering detailed guidelines on a number of issues identified in the previous sections. The first annex, devoted to the problem of drug stability, provides a comprehensive statement on both technical aspects and the responsibilities that devolve upon the manufacturer and all agencies and individuals responsible for the product throughout the distribution chain up to the time of its administration or delivery to the patient.

The second annex covers sampling procedures for industrially manufactured pharmaceuticals, offering detailed advice on procedures to follow during pharmaceutical inspections, in regular surveillance programmes, and for acceptance of consignments.



Sampling procedures for industrially manufactured pharmaceuticals is one of the topics covered in the 31st Report of the WHO Expert Committee on Specifications for Pharmaceutical Preparations. (Photo Roche.)

The final annex sets out guiding principles intended to assist small national regulatory authorities in the development of a reliable technical and administrative system for the licensing of pharmaceutical products.

WHO Expert Committee on Specifications for Pharmaceutical Preparations, 31st Report, Technical Report Series, No. 790, is published by World Health Organization, Geneva, Switzerland, 1990. 79 pp. (available in English and French; Spanish in preparation). ISBN 92 4 120790 6. Order No. 1100790. Price: CHF 9.-/USD 7.20; in developing countries CHF 6.30.

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*:

November 1990 issue of *ISO Bulletin*

TC 34

ISO 5508: 1990

Agricultural food products

Animal and vegetable fats and oils — Analysis by gas chromatography of methyl esters of fatty acids

ISO 6079: 1990

Instant tea in solid form — Specification

ISO 7513: 1990

Instant tea in solid form — Determination of moisture content (loss in mass at 103 degrees C)

ISO 7514: 1990

Instant tea in solid form — Determination of total ash

ISO 9768: 1990

Tea — Determination of water extract

TC 35

ISO 6714: 1990

Paints and varnishes

Paints and varnishes — Preparation of acid extracts from dried paint films

TC 61

ISO 1598: 1990

Plastics

Plastics — Cellulose acetate — Determination of insoluble particles

ISO 2112: 1990

Plastics — Aminoplastic moulding materials — Specification

ISO 4896: 1990

Plastics — Melamine/phenolic moulding materials — Specification

ISO 7822: 1990

Textile glass reinforced plastics — Determination of void content — Loss on ignition, mechanical disintegration and statistical counting methods

TC 106

ISO 1563: 1990

Dentistry

Dental alginate impression material

TC 132	Ferroalloys	ISO 6577: 1990	Nutmeg, whole or broken, and mace, whole or in pieces (<i>Myristica fragrans</i> Houttuyn) — Specification
ISO 8954-1: 1990	Ferroalloys — Vocabulary — Part 1: Materials	ISO 8420: 1990	Animal and vegetable fats and oils — Determination of polar compounds content
ISO 8954-2: 1990	Ferroalloys — Vocabulary — Part 2: Sampling and sample preparation	TC 35	Paints and varnishes
ISO 8954-3: 1990	Ferroalloys — Vocabulary — Part 3: Sieve analysis	ISO 3710: 1990	Lead chrome green pigments — Specifications and methods of test
TC 138	Plastics pipes, fittings and valves for the transport of fluids	TC 45	Rubber and rubber products
ISO 2048: 1990	Double-socket fittings for unplasticized poly(vinyl chloride) (PVC-U) pressure pipes with elastic sealing ring type joints — Minimum depths of engagement	ISO 6101-5: 1990	Rubber — Determination of metal content by atomic absorption spectrometry — Part 5: Determination of iron content
ISO 4422: 1990	Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications	TC 61	Plastics
TC 146	Air quality	ISO 1209-1: 1990	Cellular plastics, rigid — Flexural tests — Part 1: Bending test
ISO 6767: 1990	Ambient air — Determination of the mass concentration of sulfur dioxide — Tetrachloromercurate (TCM)/paraosaniline	ISO 1209-2: 1990	Cellular plastics, rigid — Flexural tests — Part 2: Determination of flexural properties
TC 147	Water quality	ISO 2580-1: 1990	Plastics — Acrylonitrile/butadiene/styrene (ABS) moulding and extrusion materials — Part 1: Designation
ISO 6107-7: 1990	Water quality — Vocabulary — Part 7	ISO 2897-1: 1990	Plastics — Impact-resistant polystyrene (SB) moulding and extrusion materials — Part 1: Designation
ISO 9308-1: 1990	Water quality — Detection and enumeration of coliform organisms, thermotolerant coliform organisms and presumptive <i>Escherichia coli</i> — Part 1: Membrane filtration method	ISO 4894-1: 1990	Plastics — Styrene/acrylonitrile (SAN) copolymer moulding and extrusion materials — Part 1: Designation
ISO 9308-2: 1990	Water quality — Detection and enumeration of coliform organisms, thermotolerant coliform organisms and presumptive <i>Escherichia coli</i> — Part 2: Multiple tube (most probable number) method	ISO 6402-1: 1990	Plastics — Impact-resistant acrylonitrile/styrene moulding and extrusion materials (ASA, AES, ACS), excluding butadiene-modified materials — Part 1: Designation
ISO 9390: 1990	Water quality — Determination of borate — Spectrometric method using azomethine-H	ISO 8606: 1990	Plastics — Prepregs — Bulk moulding compound (BMC) and dough moulding compound (DMC) — Basis for a specification
TC 180	Solar energy	ISO/TR 9774: 1990	Thermal-insulation materials — Application categories and basic requirements — Guidelines for the harmonization of International Standards and other specifications
ISO 9808: 1990	Solar water heaters — Elastomeric materials for absorbers, connecting pipes and fittings — Method of assessment	TC 65	Manganese and chromium ores
December 1990 issue of ISO Bulletin		ISO 9681: 1990	Manganese ores and concentrates — Determination of iron content — Flame atomic absorption spectrometric method
TC 6	Paper, board and pulps	TC 180	Solar energy
ISO 9932: 1990	Paper and board — Determination of water vapour transmission rate of sheet materials — Dynamic sweep and static gas methods	ISO 9059: 1990	Solar energy — Calibration of field pyrheliometers by
TC 34	Agricultural food products		
ISO 542: 1990	Oilseeds — Sampling		

ISO 9060: 1990	comparison to a reference pyr heliometer Solar energy — Specification and classification of instruments for measuring hemispherical solar and direct solar radiation	TC 45 ISO 247: 1990 ISO 5478: 1990 ISO 5796: 1990 ISO 6225-2: 1990 ISO 8307: 1990 ISO 10335: 1990	Rubber and rubber products Rubber — Determination of ash Rubber — Determination of styrene content — Nitration method Rubber compounding ingredients — Natural calcium carbonate — Test methods Rubber, raw natural — Determination of castor oil content — Part 2: Determination of total ricinoleic acid content by gas chromatography Flexible cellular polymeric materials — Determination of resilience Rubber and plastics footwear — Nomenclature
January 1991 issue of ISO Bulletin			
TC 6 ISO 5647: 1990	Paper, board and pulps Paper and board — Determination of titanium dioxide content	TC 48 ISO 718: 1990	Laboratory glassware and related apparatus Laboratory glassware — Thermal shock and thermal shock endurance — Test methods
TC 17 ISO/TR 10281: 1990	Steel Steel and iron — Determination of manganese content — Flame atomic absorption spectrometric method	TC 58 ISO 3500: 1990	Gas cylinders Seamless steel CO ₂ cylinders for fixed fire-fighting installations on ships
TC 28 ISO 6743-6: 1990	Petroleum products and lubricants Lubricants, industrial oils and related products (class L) — Classification — Part 6: Family C (Gears)	TC 61 ISO 1061: 1990	Plastics Plastics — Unplasticized cellulose acetate — Determination of free acidity
TC 33 ISO 8894-2: 1990	Refractories Refractory materials — Determination of thermal conductivity — Part 2: Hot-wire method (parallel)	ISO 1157: 1990	Plastics — Cellulose acetate in dilute solution — Determination of viscosity number and viscosity ratio
TC 34 ISO 8914: 1990	Agricultural food products Microbiology — General guidance for the detection of <i>Vibrio parahaemolyticus</i>	ISO 1599: 1990	Plastics — Cellulose acetate — Determination of viscosity loss on moulding
TC 35 ISO 8780-1: 1990	Paints and varnishes Pigments and extenders — Methods of dispersion for assessment of dispersion characteristics — Part 1: Introduction	ISO 1600: 1990	Plastics — Cellulose acetate — Determination of light absorption on moulded specimens produced using different periods of heating
TC 44 ISO 7289: 1990	Welding and allied processes Quick-action couplings with shut-off valve for welding, cutting and allied processes	ISO 3374: 1990	Textile glass mats — Determination of mass per unit area
ISO 7291: 1990	Welding, cutting and allied processes — Manifold regulators	ISO 8257-2: 1990	Plastics — Poly(methyl methacrylate) (PMMA) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties
ISO 9453: 1990	Soft solder alloys — Chemical compositions and forms	ISO 9773: 1990	Plastics — Determination of burning behaviour of flexible vertical specimens in contact with a small-flame ignition source
ISO 9454-1: 1990	Soft soldering fluxes — Classification and requirements — Part 1: Classification, labelling and packaging	ISO 10123: 1990	Adhesives — Determination of shear strength of anaerobic
ISO 9455-1: 1990	Soft soldering fluxes — Test methods — Part 1: Determination of non-volatile matter, gravimetric method		
ISO 10446: 1990	Welding — All-weld metal test assembly for the classification of corrosion-resisting chromium and chromium-nickel steel covered arc welding electrodes		

	adhesives using pin-and-collar specimens	ISO 9280: 1990	Water quality — Determination of sulfate — Gravimetric method using barium chloride
TC 74	Cement and lime		
ISO 680: 1990	Cement — Test methods — Chemical analysis	ISO 9439: 1990	Water quality — Evaluation in an aqueous medium of the "ultimate" aerobic biodegradability of organic compounds — Method by analysis of released carbon dioxide
TC 79	Light metals and their alloys		
ISO 6362-2: 1990	Wrought aluminium and aluminium alloy extruded rods/bars, tubes and profiles — Part 3: Extruded rectangular bars — Tolerances on dimensions and form	TC 150	Implants for surgery
		ISO 5832-3: 1990	Implants for surgery — Metallic materials — Part 3: Wrought titanium 6-aluminium 4-vanadium alloy
TC 91	Surface active agents		
ISO 2871-2: 1990	Surface active agents — Detergents — Determination of cationic-active matter content — Part 2: Cationic-active matter of low molecular mass (between 200 and 500)	TC 160	Glass in building
		ISO 9051: 1990	Glass in building — Glazed assemblies containing fire-resistant transparent or translucent glass, for use in building
TC 107	Metallic and other inorganic coatings		
ISO 3497: 1990	Metallic coatings — Measurement of coating thickness — X-ray spectrometric methods	TC 171	Micrographics and optical memories for document and image recording, storage and use
		ISO 10196: 1990	Micrographics — Recommendations for the creation of original documents
TC 138	Plastics pipes, fittings and valves for the transport of fluids		
ISO 580: 1990	Injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings — Oven test — Test method and basic specifications	TC 172	Optics and optical instruments
		ISO 9689: 1990	Raw optical glass — Resistance to attack by aqueous alkaline phosphate-containing detergent solutions at 50 degrees C — Testing and classification
ISO 7676: 1990	Unplasticized poly(vinyl chloride) (PVC-U) pipes — Dichloromethane test		
TC 147	Water quality		

Chemistry and developing countries—

An international conference addressing issues relating to chemistry for the environment and organizing science to benefit the Third World was held at Imperial College, London, UK, in April 1991.

Introduction

This conference was the second organized by The Royal Society of Chemistry (RSC) on the theme of chemistry and development. The 1991 conference, which formed part of the celebrations marking the 150th anniversary of the RSC, dealt with environmental and organizational issues.

The rapidly changing economic and political climate, the emergence of global issues with a chemical component (the environment in general, CFCs in particular, even AIDS) and the spreading of a much more frank and realistic attitude in many

quarters all combine to create the need and opportunity for a new look at the role which chemists and other scientists of the developing world could play in the development of their countries.

On this basis, the longer-term aim of the conference was to enhance the ability of scientists to contribute to the well-being of their people by helping (through new ideas, contacts, information and expertise) to increase their interest and ability to play a more pro-active role in the wider applications of their professional knowledge; for



Sir Rex Richards presented an RSC Honorary Fellowship to Prof. Federico Mayor (right) at the opening of the conference.

example, in wealth-generation and job-creation, in safeguarding health and the environment and promoting sustainable development, in institution-building and the formulation of relevant national policies, as well as in teaching and research.

The conference focused on two themes: (1) chemistry for the environment and (2) organizing science to benefit the Third World. These were organized as parallel sessions, with all participants joining together for the opening and closing ceremonies.

At the opening session, participants were welcomed by Sir Rex Richards, President of RSC. He then introduced the following keynote speakers:

- Prof. Federico Mayor, Director-General of UNESCO;
- Prof. Yves Jeannin, President of IUPAC;
- Dr R. Taylor, Assistant Director General of the British Council.

Chemistry for the environment

This theme dealt with the techniques of identifying and monitoring environmental problems, both in the UK and overseas. There were three sessions devoted to land pollution, air pollution and water pollution respectively.

In the session on land pollution, Prof. P. J. Peterson (King's College, London, UK) presented a lecture on 'Environmental chemistry of endemic diseases.' Peterson pointed out that human health, especially of rural populations in developing countries, is still directly influenced by the environment, whether from vector-borne diseases or from the geological abundance or deficiency of elements. In recent years, vector-borne disease and diarrhoeal-type diseases, especially in children, have assumed prominence. Estimates of infant mortality and childhood mortality reveal that 5 million children under five die each year from diarrhoeal diseases. Some 200 million people are affected by shistosomiasis and 400 million live in malaria-affected areas.

In many developing countries, nutritional problems are mainly related to lack of sufficient food and inadequate nutrient intake. Around 800 million people are severely undernourished. With respect to specific nutritional disorders, it has been estimated that 800–900 million people are anaemic due to iron deficiency, 190 million have iodine-deficient goitre and approximately 7 million children suffer from vitamin A deficiency annually — 500 000 become blind and 300 000 die.

In addition to goitre, vitamin A and iron deficiency, several other major diseases with a chemical aetiology include dental and skeletal fluorosis, arsenism and selenosis as well as Keshan disease and Kaschin–Beck disease. Peterson described the significance of environmental chemistry to an understanding of human health aspects of these endemic diseases.

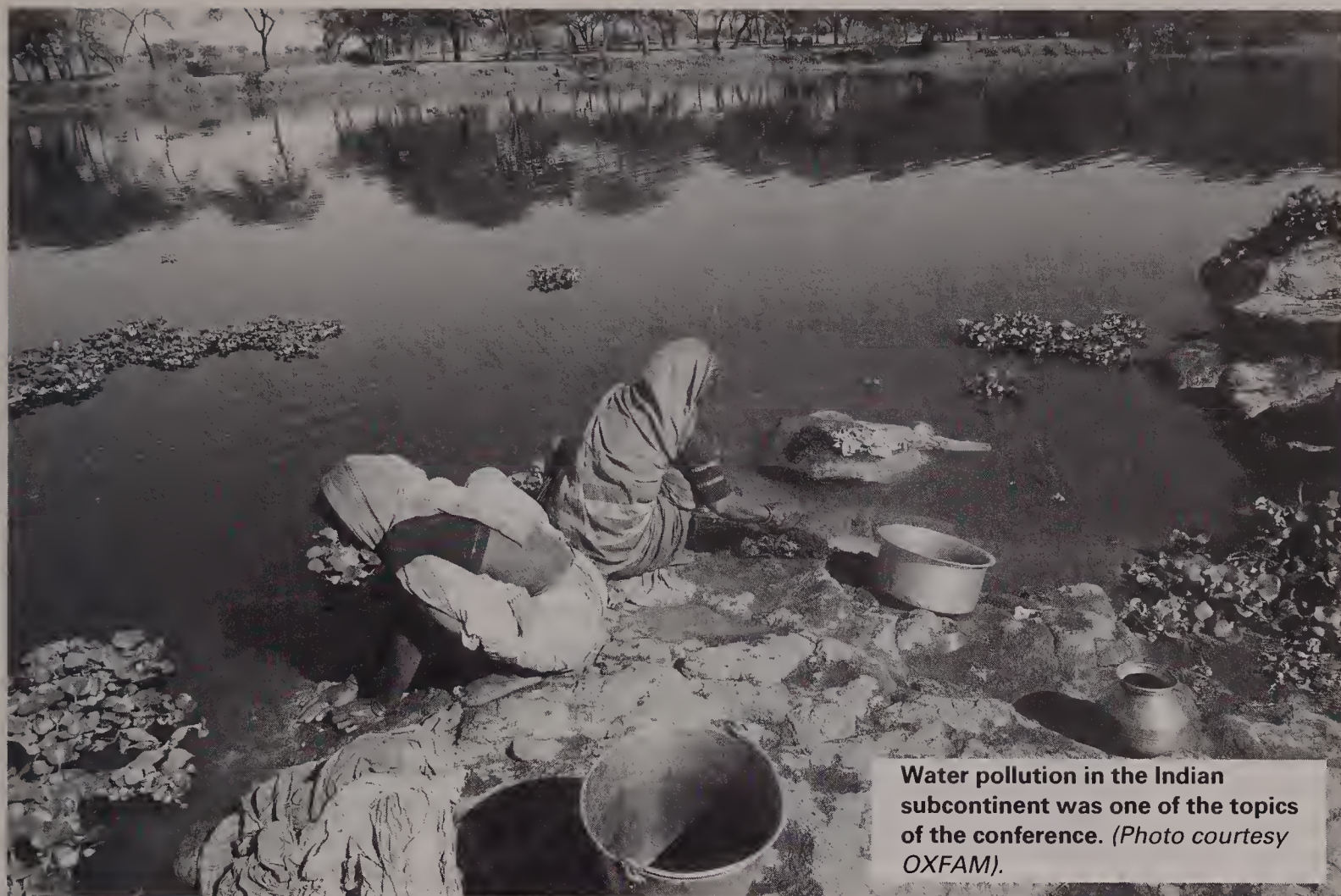
The session on air pollution included a lecture by Prof. Tania Tavares (Federal University of Bahia, Brazil) on 'Air pollution problems in Brazil.'

Brazil faces air-pollution problems of both a regional and global nature. Regional problems of industrial and urban origin exist only in a localized, although serious, scale in many cases. For example, the town of Cubatão, considered the most-polluted industrial area in the world, has, until recently, suffered regular landslides due to the destruction of slope vegetation.

Identification of the cause-and-effect relations on vegetation damage is needed, said Tavares. The city of São Paulo, with its 9.7 million inhabitants, suffer from pollution arising from traffic. With a 14.2% growth rate per decade, atmospheric pollution in the city would have been even worse if alcohol had not been used instead of gasoline for about half of the city's fuel consumption. Use of (lead-free) alcohol as a fuel has reduced carbon monoxide and hydrocarbon emissions by about 20%. On the other hand, aldehyde levels are increasing.

Participants at the 2nd International Conference on Chemistry and Developing Countries.





Water pollution in the Indian subcontinent was one of the topics of the conference. (Photo courtesy OXFAM).

Tavares reported that on a global scale, Brazilian atmospheric emissions of the greenhouse gas CO_2 have increased by more than 3000% over the past 27 years. Fossil fuels account for about 300% of this. The Brazilian per-capita emission of CO_2 is relatively low (0.38 tons C per capita) being only 4.53% of the per capita emission in USA and 33.5% of the world's per capita emission. The major part of the increase is due to forest burning which accounts for about 6.1% of the present estimated world emissions of 5.5×10^9 tons C per year.

Dr B. K. Handa (National Environmental Engineering Research Institute [NEERI], Nagpur, India) spoke about 'Water pollution problems in the Indian subcontinent with special reference to the Ganga Action Plan.' He pointed out that the river Ganga has, for years, been subjected to tremendous pressures. Most of its water in the upper reaches is diverted to canals, and untreated domestic and industrial wastewaters are dumped into the river at several places. It is estimated that 900 million litres of sewage is discharged into the river every day and this accounts for 75% of the total pollution reaching the river. Residues of pesticides and insecticides used in agriculture also contribute non-point pollution in the river.

Recognizing the magnitude of the problem and realising the importance of water quality as a principal element of river management, the Government of India established the Central Ganga Authority in 1985 for planning and execution of a

timebound programme to prevent pollution of the river. The Ganga Action Plan (GAP) is being implemented through R&D inputs in the areas of water quality monitoring, water quality modelling, wastewater treatment and environmental impact assessment. These inputs are provided by several research and academic institutions, the Council of Scientific and Industrial Research laboratories public health engineering departments, consulting firms, and international and bilateral funding agencies.

NEERI has been engaged in a 36-month study since December 1988 on impact assessment of the Ganga Action Plan on public health under the joint sponsorship of the Ganga Project Directorate and the Indian Council of Medical Research, and in collaboration with the All India Institute of Hygiene and Public Health, Calcutta. The study aims at evaluation of the benefits of the project *vis-a-vis* the costs, and identification of corrective/supplementary measures, if deemed necessary. The cities of Varanasi and Nabadwip have been chosen as project sites in view of their religious and cultural significance. The study will also help in designing cost-effective strategies for similar water quality management programmes in future.

Yet another significant contribution of NEERI to GAP relates to ranking technology options for wastewater management. A ranking system — based on the criteria of environmental, health and aesthetic risks; annual cost; operation and main-

tenance costs; land requirement; and system reliability developed by the Institute — has been used to identify most appropriate and cost-effective wastewater treatment systems for Munger and Bhagalpur, two towns in Bihar. The study identified a stabilization pond for Munger and aerated lagoon for Bhagalpur as the most appropriate options amongst various feasible alternatives to meet effluent standards.

Organizing science to benefit the Third World

The second theme of the conference concentrated on the mechanisms and strategies for organizing science (with particular reference to chemistry) to benefit developing countries. It covered training, resources and the role of national bodies and governments.

Professor Geoffrey Oldham (Science Policy Research Unit, University of Sussex, UK) lectured on 'Science, technology and development — lessons of the last 20 years.' His presentation reviewed the experiences of developing countries as they have sought to apply science and technology to solve development problems over the past 20 years. He gave particular attention to a few key problems such as the role of imported technology, the type of scientific and technical activities most appropriate for development needs, the institutional location of these activities, the management of technical change, and the policies for science and technology for development.

He illustrated the nature of these problems, and one approach to their solution, with a case study of technology transfer to the offshore oil industry in China.

His presentation concluded with the identification of some world trends which were likely to have a considerable impact on the future ability of developing countries to benefit from advances in science and technology.

- Other papers presented on this theme included:
- Impact of chemical industry on the development of the Third World — A. Tcheknavorian-Asenbauer (UNIDO, Vienna, Austria);
 - Technology transfer: ground rules for wealth creation — I. A. Harvey (British Technology Group, London);
 - Planning a chemical industry in Taiwan: a case study — T. K. Wu (Grand Pacific Petrochemical Corp., Taipei, Taiwan);
 - The importance of professional organizations and professional qualifications — M. M. Singh (Ministry of Science, Kuala Lumpur, Malaysia);
 - Technician training and instrument production in India: the experience of CSIO — S. R. Gowariker (Central Scientific Instruments Organization, Chandigarh, India);
 - Science and technology in Latin America and the Caribbean: strategies for tackling present and future challenges with limited resources — G. Malek (UNESCO, Montevideo, Uruguay).

Dr Angela Danil de Namor (University of Surrey, UK) — an Associate Member of the IUPAC Commission on Solubility Data — spoke about 'Contributions to the development of chemistry in South America: the link between universities of Surrey, UK and San Agustin, Peru.' An edited version of this paper will be published in a subsequent issue of *Chemistry International*.

IUPAC Bureau member Prof. Ingemar Wadsö presented a lecture on 'The problems of giving and receiving aid'. His talk concentrated on the needs and possibilities of encouraging high-quality university teaching and scientific research in developing countries.

He felt that aid programs in the basic sciences — mathematics, physics, chemistry and biology — are too few and often not planned with a long enough time perspective. Individual projects without follow-up programs might be of little value and may even be detrimental to the receiving country as they may lead to brain-drain effects. Creation of adequate laboratories, libraries, workshops and training of technicians are essential.

Authorities, including university officials, in the receiving countries can prevent the efficient use of aid money by excessive bureaucracy and lack of cooperation. It may be of questionable value to initiate projects in politically unstable countries.

Many different forms and directions of aid programme are needed. But it seems as if links between individual universities in developed and developing countries should be encouraged. The international scientific unions (for chemistry: IUPAC) and their umbrella organization (ICSU) are engaged in programs directed towards the developing countries but could probably be encouraged to do more.



Prof. Ingemar Wadsö spoke about the problems of giving and receiving aid.

Chemistry and the atmosphere

CHEMRAWN VII — The World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change — will be held in Baltimore, USA, 2–6 December 1991

The World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change is the seventh in the series of IUPAC-sponsored conferences devoted to Chemical Research Applied to World Needs (CHEMRAWN). CHEMRAWN VII will be held in Baltimore, Maryland, USA, on 2–6 December 1991. It is co-sponsored by the American Chemical Society in association with The National Academy of Science, The Third World Academy of Science, and the US Environmental Protection Agency (EPA).

The General Chairman of the CHEMRAWN VII Organizing Committee is Robert E. Sievers who is Director of the Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado. Jack G. Calvert (US National Center for Atmospheric Research, Boulder) is Chairman of the Program Committee. Calvert is also Chairman of the IUPAC Committee on Atmospheric Chemistry.

The Earth's atmosphere is a key component of our common globe. The responsibility to preserve the virtues and augment the bounties of the Earth falls to all mankind. Chemistry can play a creative role in bringing about better environmental quality.

This conference will differ from others by endeavouring to assess the latest scientific understandings and translate these into policy recommendations that will alter beneficially the future actions of governments, corporations, and individuals.

Accordingly, the objectives of CHEMRAWN VII are to:

1. define and put into perspective the prospects for future global change, its relationship to changes in atmospheric chemistry, and the far-reaching physical and socio-economic impacts of such changes;
2. characterize the present state of knowledge, identify knowledge gaps, and define research priorities with the aim of providing decision-makers in government, industry, academia, development and private volunteer organizations with the information necessary for effective government and private-sector response;
3. accelerate implementation of research priorities and recommendations by promoting international cooperation among the various interests of the global system;
4. identify pragmatic ways to accommodate as well as abate global change.



Dr Robert E. Sievers is General Chairman of the CHEMRAWN VII Organizing Committee.

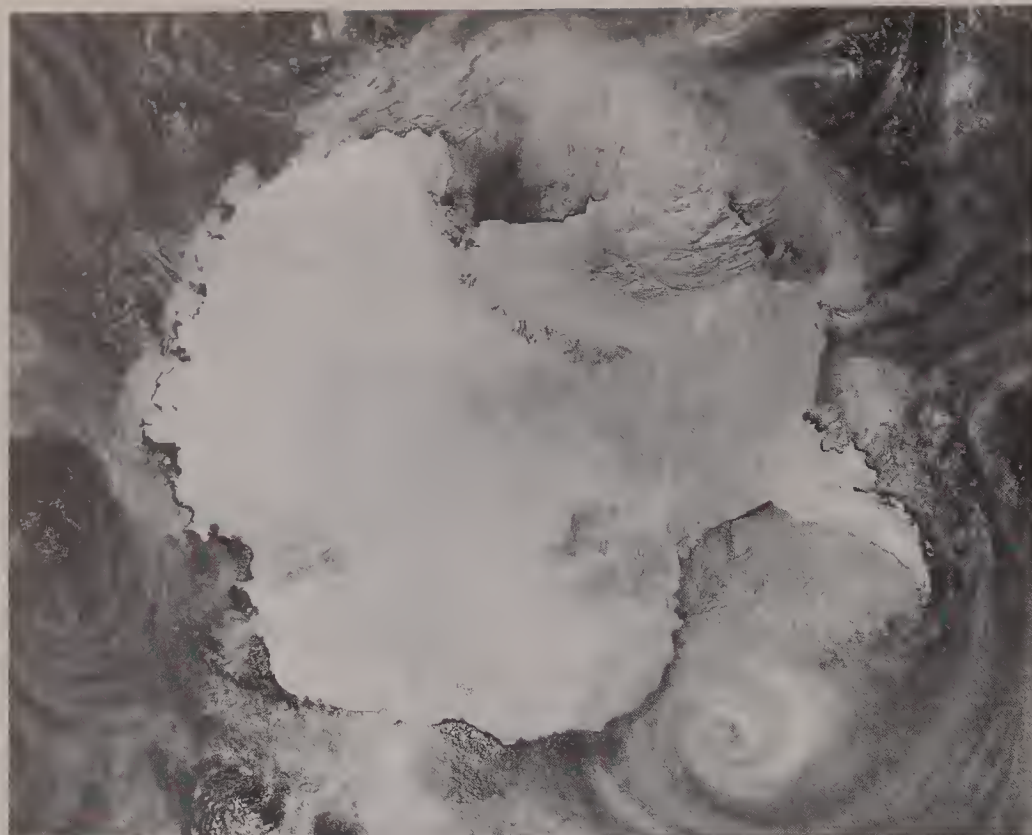
The conference subjects are:

- instruments and techniques for atmospheric chemistry;
- chemistry of the urban atmosphere;
- chemistry of the remote atmosphere;
- chemistry of the stratosphere;
- chemistry of clouds and precipitation;
- biogeochemical processes;
- inventories and budgets;
- reaction kinetics and mechanisms;
- global-scale data and models;
- chemistry and physics of atmospheric aerosols;
- paleoatmospheric chemistry;
- interactive chemistry of the atmosphere and oceans.

The scientific programme includes lectures on the following topics:

Atmospheric chemistry and global change

- D. L. Albritton (NOAA, Aeronomy Laboratory, USA);
- E. P. Blanchard (Du Pont, USA);
- G. M. Hidy (Electric Power Research Institute, USA);
- V. A. Koptug (USSR Academy of Sciences, USSR);
- C. H. Krauch (Chemische Werke Hüls AG, Germany);
- A. P. Mitra (Council of Scientific & Industrial Research, India);
- M. Oppenheimer (Environmental Defense Fund, USA).



Stratospheric ozone depletion, particularly evident over Antarctica (left) is one of the topics to be explored at CHEMRAWN VII.

Urban pollution in developing countries has reached crisis proportions.



Stratospheric ozone depletion

- G. Brasseur (National Center for Atmospheric Research, USA);
- H. Johnston (University of California, Berkeley, USA);
- R. Jones (Cambridge University, UK);
- G. Mégie (Université Paris, France);
- M. J. Molina (Massachusetts Institute of Technology, USA);
- F. S. Rowland (University of California, Irvine, USA);
- I. Shankland (Allied-Signal Inc., USA);
- S. Solomon (NOAA, Aeronomy Laboratory, USA);
- R. C. Worrest (US Environmental Protection Agency, USA).

- D. V. Bates (University of British Columbia, Canada);
- D. Kley (KFA, Julich, Germany);
- S. C. Liu (NOAA, Aeronomy Laboratory, USA);
- G. S. Samuelsen (University of California, Irvine, USA).

Acid generation in the troposphere: acid rain

- J. Ando (Chuo University, Japan);
- T. E. Graedel (AT&T Bell Laboratories, USA);
- O. Hov (University of Bergen, Norway);
- T. C. Hutchinson (University of Toronto, Canada);
- S. A. Penkett (University of East Anglia, UK);
- H. Rodhe (University of Stockholm, Sweden).

Methods of measurement of atmospheric trace species

- E. V. Browell (NASA, Langley, USA);
- D. H. Ehhalt (KFA, Julich, Germany);
- H. I. Schiff (York University, Canada);
- S. Slanina (ECN, Petten, The Netherlands);
- V. E. Zuev (Institute of Atmospheric Optics, USSR).

Global warming: the greenhouse effect

- R. J. Charlson (University of Washington, USA);
- R. J. Cicerone (University of California, USA);
- V. Ramanathan (Scripps Institute of Oceanography, USA);
- X. J. Zhou (Academy of Meteorological Science, China).

Tropospheric build-up of oxidants

- H. Akimoto (National Institute for Environmental Studies, Japan);



Changes in emissions of methane to the atmosphere, such as from these rice paddies in Nepal, may effect atmospheric composition and exacerbates the build-up of greenhouse gases from anthropogenic sources.



This research station in Greenland is one of many field sites at which global change is studied.

The official language of the conference will be English.

The third and final circular, including registration and hotel information, will be mailed in September 1991. Hotel rooms have been set aside, at reduced rates, for conference attendees and a social programme will be offered for accompanying guests. Detailed information will be available in the final circular.

Some financial assistance may become available to support travel to the conference for scientists from developing countries. Funds are also being raised to enable scientists from developing countries to attend the training workshop which will be held immediately preceding CHEMRAWN VII.

For further information please contact: CHEMRAWN VII Secretariat, c/o American Chemical Society, Room 205, 1155-16th Street, N. W., Washington, DC 20036, USA.

All photos are courtesy of CIRES, University of Colorado at Boulder, USA.

Training workshop

A 2-week training workshop will be arranged by the Office of Research and Development of EPA. The workshop will be held at the Area Training Center at Rutgers University, New Brunswick, New Jersey, just prior to the CHEMRAWN VII conference.

The workshop will be structured around two of EPA's standard training courses:

1. Atmospheric sampling;
2. Quality assurance for air pollution measurement systems.

Much of the material in these courses is applicable to both health-related and global-climate pollutants. Laboratory work includes sampling and analysis of fine, coarse and respirable particles. The participants will be introduced to new, simple, passive techniques for monitoring ozone and other gaseous pollutants. The training programme will include instruction in the use of simple models to predict ozone.

Scientists from several agencies will discuss ways for developing countries to participate in research and monitoring related to global warming and stratospheric ozone destruction. The workshop will provide an excellent opportunity for young chemists from around the world to interact with experts in the field of atmospheric chemistry.

The workshop is open only to CHEMRAWN VII registrants.

Letter to the Editor

The Periodic Table

Sir,

Professor Ian Mills¹ asks why the form of Periodic Table suggested by Longuet-Higgins² has never become popular. A possible answer is that it suffers from the disadvantage of all forms of table based exclusively on electronic configuration of grouping helium with the alkaline earth metals, and of implying different configurations for a number of elements from the actual ones (e.g. $4s^23d^9$ for copper instead of $4s3d^{10}$, $6s^25d4f^2$ for praseodymium instead of $6s^24f^3$).³ A further problem is that the order of filling of orbitals is not solely determined by their energies (e.g. $4s$ is filled before $3d$ even though the $3d$ level is lower).^{4,5}

In my opinion the pyramided form of table is best, and the one that should be adopted as standard.^{6,7}

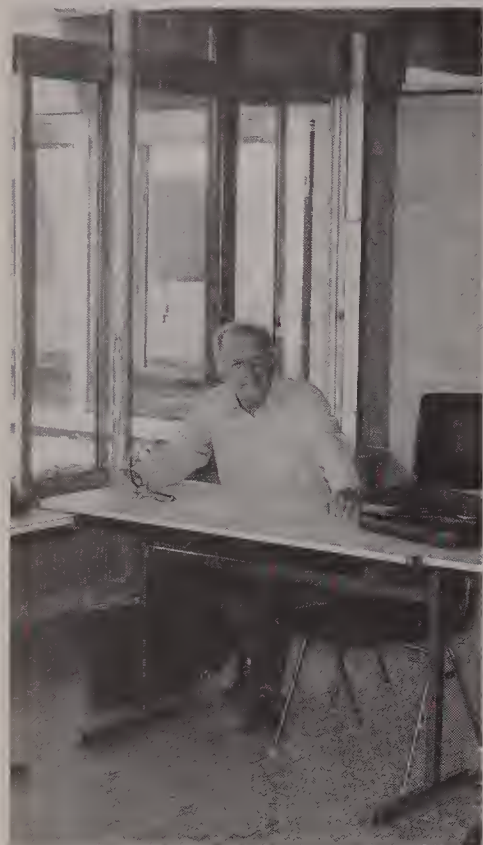
P. G. Nelson,
School of Chemistry,
University of Hull,
Hull HU6 7RX, UK.

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Organic chemistry of sulfur

Professor Jan Michalski reports on the IUPAC-sponsored 14th International Symposium on the Organic Chemistry of Sulfur held in Łódź, Poland, on 2–7 September 1990.



Prof. Jan Michalski, past member of the IUPAC Bureau, was official IUPAC representative at the Łódź symposium.

Introduction

Sulfur and its inorganic and organic compounds are widely distributed in nature and have found various applications. Nowadays, sulfur not only plays an important role in various fields of chemistry but also links different branches of science.

It is doubtful whether anybody could have predicted such rapid developments in the chemistry of sulfur in 1964 when a small group of enthusiastic sulfur chemists met to Liblice, CSSR at the invitation of Prof. V. Horak to take part in the first meeting devoted to this element. Now, 26 years later, it is recognized that the vigorous development of organic chemistry in general and organic synthesis in particular could not have been possible without sulfur and its compounds.

The Łódź conference

The IUPAC-sponsored 14th International Symposium on the Organic Chemistry of Sulfur was held in Łódź, Poland, on 2–7 September 1991 with Prof. Marian Mikołajczyk as chairman. Over 200 chemists from 25 nations and five continents attended the meeting. For the host country Poland it was an appropriate opportunity to organize this symposium because elemental sulfur is one of its most important natural resources.

The symposium covered a variety of themes including traditional topics such as:

- synthesis of organic sulfur compounds and their applications;
- theoretical, mechanistic and stereochemical aspects of the organic chemistry of sulfur;
- electrochemistry of organosulfur compounds;
- heterocyclic sulfur compounds.

The programme also included lectures on the industrial organic chemistry of sulfur and bioorganic chemistry of sulfur. Overall, 19 plenary and invited lectures, 53 contributed papers and 89 posters were presented at the symposium.



Prof. Marian Mikołajczyk (left) was chairman of the symposium. In January 1991 he succeeded Prof. Michalski as head of the Centre of Molecular and Macromolecular Studies of the Polish Academy of Sciences. With him is Prof. Hans Cerfontain, University of Amsterdam, Netherlands.

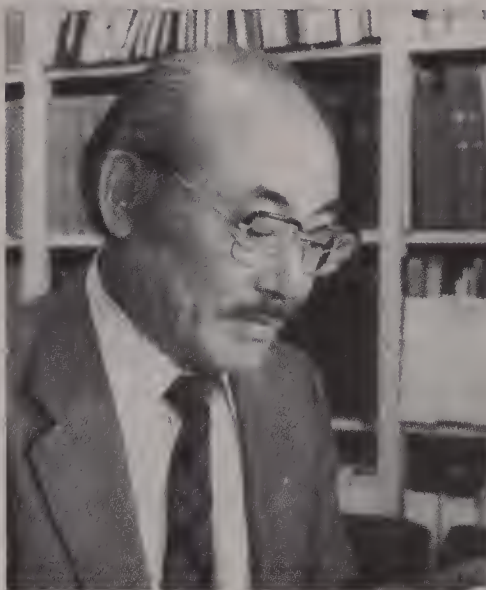
Plenary lectures

Plenary sessions started with a lecture by Prof. Eric Block (State University of New York at Albany, USA) who presented recent results of his investigations on organosulfur compounds contained in onions. Two lectures concerned the chemistry of sulfur heterocycles: Prof. Carl. Th. Pedersen (Odense University, Denmark) considered recent views on the structure of trithiapentalenes and Prof. Wataru Ando (Tsukuba University, Japan) talked on strained alylidene episulfides.

Prof. Jan Michalski's lecture was devoted to the chemistry of organo-phosphorus-sulfur pseudo-halogens. Prof. Henri Kagan (University Paris-Sud, France) spoke about new approaches to the asymmetric synthesis of sulfoxides, based on chiral cyclic sulfites. Professors Mikail Voronkov and Eleonora Deryagina (Academy of Sciences of the USSR, Irkutsk) presented a lecture on the high-temperature reactions of thiyl radicals.

Thiono- and dithiocarboxylic esters, especially the α , β -unsaturated and α -amino derivatives, were the subject of a lecture by Prof. Klaus Hartke (University of Marburg, Germany). Professor Victor Drozd, USSR) Timiryazev Agricultural Academy of Moscow, USSR), who was scheduled to deliver a lecture on the pericyclic reactions of the dithiocarboxylic acid derivatives, did not arrive; however he submitted his paper which will be published in a special issue of *Phosphorus, Sulfur and Silicon*.

chemistry. His influence on Japanese chemistry and heteroatom chemistry is immense. He has retired from Tsukuba University and recently become director of the Institute of Heteroatom Chemistry in Osaka, Japan.



Prof. Sigeru Oae was honorary guest at the symposium.

Invited lectures

Ten invited lectures were also presented during the symposium. four of them were devoted to the application of organosulfur compounds in the organic synthesis. Two lectures concerned sulfur heterocycles and other lectures were devoted to: the chemistry of spiro-sulfuranes; NMR-structural assignments of sulfur heterocycles; polymerization and copolymerization of elemental sulfur, and hypervalent three-membered thiaheterocyclic intermediates.

Dr Kiełbasiński and his colleagues were responsible for the efficient organization of the conference including a comprehensive social programme for active participants and accompanying persons. This included several excursions, a sight-seeing tour of Łódź, an informal mixer, a beer evening and a special reception given by the President of Łódź.



A lecture by Prof. Eric Block considered organosulfur compounds present in onions.

Prof. Edward D. Weil (Polytechnic University of New York, USA) presented an interesting review on recent industrial applications of organosulfur compounds. In turn, Prof. Gordon Lowe (Oxford University, UK) discussed results of his work on the application of chiral [^{16}O , ^{17}O , ^{18}O] sulfate monoesters for the investigation of enzyme-catalysed sulfonyl transfer reactions.

Finally, Prof. Sigeru Oae (Okayama University, Japan), the honorary guest at symposium, gave an interesting and exhaustive survey of unsolved problems in the organic chemistry of sulfur. Prof. Oae is one of the founders of modern sulfur



Dr P. Kiełbasiński, secretary of the conference, with Dr Kalman Takaes (Budapest, Hungary).

New polymers Kyoto, Japan 30 November–1 December 1991

IUPAC
SPONSORED

The IUPAC-sponsored International Symposium on New Polymers will be held at Kyoto Miyako Hotel, Japan. This symposium has been organized in honour of Professor Takeo Saegusa, immediate Past-President of the IUPAC Macromolecular Division and Past-President of the Society of Polymer Science in Japan, on his formal retirement from his chair at the Department of Synthetic Chemistry, Kyoto University, as of 31 March 1991.



**Prof. Takeo
Saegusa:**
immediate Past-
President of the
Macromolecular
Division.

In deference to Saegusa's contributions to synthetic polymer chemistry, the symposium will focus on new polymers and emphasize the synthetic aspects of polymer science including:

- synthesis of new polymers;
- new polymerization reactions;
- new polymerization catalysts and mechanisms.

The last decade has witnessed the emergence of a family of new polymers, the so-called 'functional polymers' and 'high-performance polymers' which have now established unique positions in academia and industry. The symposium's focus on new polymers thus stems from the organizer's conviction that in the coming years the exploration of new polymers should become increasingly important and more widely recognized. This meeting aims to provide an incentive to such exploration.

The scientific programme will consist of two plenary lectures, 15 invited lectures and contributed poster papers. Summaries of plenary and invited lectures and contributed papers will be published in a preprints book to be distributed at the symposium.

The manuscripts of plenary and invited lectures will be published as symposium papers in *Die Makromolekulare Chemie, Macromolecular Symposia*.

The official language of the symposium will be English. The registration fees before/after 1 September 1991 are JPY 30 000/40 000 for active participants and JPY 15 000/20 000 for students. About 250 hotel rooms have been booked for the symposium.

The symposium site, Kyoto Miyako Hotel, is located in the north-east part of Kyoto City and easily accessible by taxi from Kyoto station, downtown Kyoto and other symposium hotels.

In mid-November and early December, the weather in Kyoto is comfortable — mostly sunny, dry and relatively cool (5–15°C).

Enzymes in organic synthesis New Delhi, India 6–9 January 1992

IUPAC
SPONSORED

An International Symposium on Enzymes in Organic Synthesis will be held at the Holiday Inn, New Delhi, India on 6–9 January 1992. The symposium is sponsored by IUPAC, the National Organic Symposium Trust (NOST) and the University of Delhi.

The scientific programme will consist of eight plenary lectures, 20 invited lectures and contributed papers — mostly in the form of posters. All aspects of the topic 'enzymes in organic synthesis' will be covered. In particular, the symposium will focus on the following topics:

- enzymes: structures; activity; mechanisms; and mimics;
- enantiomerically pure chiron synthesis with enzymes and micro-organisms;
- production of pharmaceuticals and other fine organic chemicals with enzymes and micro-organisms;
- catalytic antibodies;
- newer aspects of enzymes in organic synthesis.

Several leading scientists in these areas from throughout the world have provisionally agreed to participate and present lectures.

The official language of the meeting will be English. No provision will be made for translation into other languages.

A scientific exhibition of latest equipment and know-how on the use of different enzymes and



Holiday Inn, New Delhi is the venue of the International Symposium on Enzymes in Organic Synthesis.

micro-organisms in organic reactions is planned during the symposium.

The registration fees before/after 30 September are: for scientific participants USD 350/400; for accompanying persons and scientific participants from academia of Third World countries USD 150/175 and for students USD 50/60. The charges include registration kit, book of abstracts, morning coffee, lunch and afternoon tea for the duration of the symposium and the banquet dinner.

Delhi is the capital city of modern India. The ancient monuments and bustling bazaars of old Delhi and the architectural splendour of New Delhi convey the rich cultural heritage of India. January is a delightful time of the year with a lot of sunshine. The day temperatures range between 14 and 20°C while the night temperatures remain between 5 and 8°C.

Vacuum microbalance techniques

The 24th International Conference on Vacuum Microbalance Techniques will be held at Hammamet, Tunisia, on 1–3 November 1991.

Further information from: either (1) Prof. M. Jemal (24 VMT) Faculté des Sciences, Département de Chimie, Campus Universitaire, 1060 Tunis, Tunisia. Tel: +216 (1) 512600. Fax: 216 (1) 500666; or (2) Dr S. A. A. Jayaweera (24 VMT), Division of Chemical and Biotechnological Sciences, School of Science and Technology, Teesside Polytechnic, Middlesbrough, TS1 3BA, UK. Tel +44 (642) 342466. Fax: +44 (642) 226822.

Medicinal plants, spices and other natural products

The UNESCO-sponsored 7th Asian Symposium on Medicinal Plants, Spices, and Other Natural Products (ASOMPS VII) will take place at the University of the Philippines at Diliman, Quezon City, Metro Manila, on 2–7 February 1992.

The theme of the symposium is the promotion of research in natural products and development of cooperative programmes in botany, chemistry and pharmacology. The meeting will cover the following subject areas: botany, chemistry, conservation, ethnopharmacognosy, marine natural products, medicinal plants, pharmacology, spices, sustained development of natural resources in Asia. A satellite workshop on marine natural products will be held at the Bolinao Marine Station after the symposium.

For particulars please contact: ASOMPS VII Secretariat, Marine Science Institute, University of the Philippines, P.O. Box 1, Diliman, Quezon City 1101, Philippines.

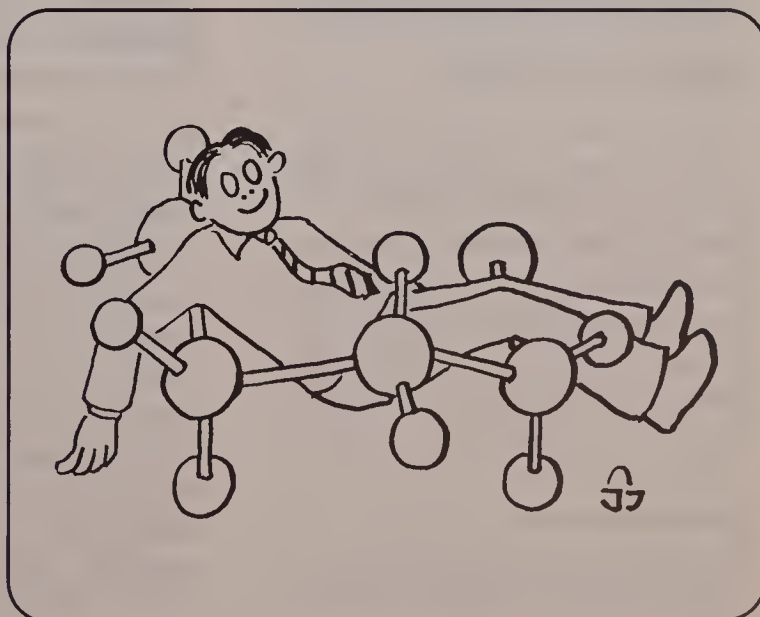
Chemistry in Africa

The 5th International Chemistry Conference in Africa (5th ICCA) will take place at the University of Botswana, Gaborone, on 27–31 July 1992. The official language of the conference will be English.

The theme of the conference is 'Organization of chemistry for the economic and industrial development of Africa.' Plenary lectures will address some of the following issues:

- exploitation and management of Africa's natural resources;
- problems and prospects for the economic development of Africa;
- impact of chemistry on the environment and its management;
- facilitating industrial development;
- education in chemistry;
- chemistry and agriculture.

All correspondence should be directed to: The Secretary, 5th ICCA, Department of Chemistry, University of Botswana, Private Bag 0022, Gaborone, Botswana. Tel: +267 351151. Telex: 2429 BD. Fax: +267 356591.



Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1991

Spectroscopy of biological molecules

1–6 September. 4th European Conference on the Spectroscopy of Biological Molecules. York, UK.

(Prof. R. E. Hester, Department of Chemistry, University of York, Heslington, York YO1 5DD, UK. Tel: +44 (0904) 59861. Telex 57933 YORKUL G.)

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably **2 YEARS** and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *CI*, Vol. 11, No. 1, pp. 4–5, 1989.

Macrocylic chemistry

1–6 September. 16th International Symposium on Macrocylic Chemistry. Sheffield, UK.

(Dr D. E. Fenton, Department of Chemistry, The University, Sheffield, S3 7HF. Tel. +44 (0742) 768555. Fax. +44 (0742) 739826. Telex 547216 UG SHEF G.)

Mössbauer effect

16–20 September. International Conference on the Applications

of the Mössbauer Effect. Nanjing, China.

(Prof. Y. F. Hsia, Chairman, ICAME '91, Department of Physics, Nanjing University, Nanjing 210008, P. R. China. Tel. +86 (025) 647361. Fax. +86 (025) 403435. Telex 34151 PRCNU CN.)

Recycling of polymers

18–20 September. International Symposium on Recycling of Polymers: Science & Technology. Marbella, Spain.

(Prof. W. Heitz, Philipps-Universität Marburg, Physikalische Chemie, Hans-Meerwein-Strasse, D(W)-3550 Marburg, FRG. Tel: +49 (6421) 285777. Fax. +49 (6421) 285785. Telex 482373 UMR D.)

Self-propagating high temperature synthesis

23–28 September. 1st International Symposium on Self-Propagating High-Temperature Synthesis (SHS). Alma-Ata, USSR.

(Symposium Organizing Centre, Institute of Structural Macromeritics, USSR Academy of Science, 142432 Chernogolovka, Moscow Region, USSR).

Electron spin echo spectroscopy

25–28 September. International Workshop on Electron Echo Spectroscopy. Novosibirsk, USSR.

(Prof. Yu. D. Tsvetkov, Institute of Chemical Kinetics & Combustion, 630090 Novosibirsk, USSR. Tel. +7 (3832) 354832. Fax. +7 (3832) 352350. Telex. 133148 KING SU.)

Macromolecule-metal complexes

30 September–5 October. 4th International Symposium on Macromolecule–Metal Complexes. Siena, Italy.

(Prof. R. Barbucci, Dipartimento di Chimica, Università di Siena, Piano dei Mantellini 44, 53100 Siena, Italy).

Olefin and vinyl polymerization

14–18 October. International Symposium on Olefin and Vinyl Polymerization and Functionalization — Reaction, Mechanism and Industrial Application. Hangzhou, China.

(Secretariat of IUPAC Polymerization 91 Hangzhou, Prof. Zhen-Hua Huang, Director of International Programs Office, Zhejiang University, Hangzhou 310027, China).

New polymers

30 November–1 December. International Symposium on New Polymers. Kyoto, Japan.

(Prof. Toshinobu Higashiura, Department of Polymer Chemistry, Kyoto University, Yoshida, Sakyo-ku, Kyoto 606, Japan.)

CHEMRAWN VII

2–6 December. World Conference on Chemistry of the Atmosphere: Its Impact on Global Change. Baltimore, Maryland, USA.

(CHEMRAWN VII Secretariat, c/o American Chemical Society, 1155, 16th Street, N.W., Room 205, Washington, D.C. 20036-4899, USA.)

Enzymes in organic synthesis

6–9 *January*. International Symposium on Enzymes in Organic Synthesis. New Delhi, India.

(Dr V. S. Parmar, Department of Chemistry, University of Delhi, Delhi-110, 007, India. Tel. +91 (11) 2918994 (office) or +91 (11) 7115562 (home). Fax. +91 (11) 352471. Telex 78099-DU-IN.)

Centenary of Geneva Conference

22–24 *April*. Centenary of Geneva Conference — Organic Chemistry: Its Language and Its State of the Art. Geneva, Switzerland.

(Dr M. V. Kisakürek, Editor, Helvetica Chimica Acta, Redaktion, Postfach 313, CH-4010 Basel, Switzerland.)

Biological and environmental reference materials

11–14 *May*. 5th International Symposium on Biological and Environmental Reference Materials (BERM-5). Aachen, Germany.

(Dr W. R. Wolf, Nutrient Composition Laboratory, United States Department of Agriculture, Beltsville, MD 20705, USA.)

Calorimetry and thermodynamics of biological processes

15–19 *May*. International Symposium on Calorimetry and Thermodynamics of Biological Processes. Fiskebäckskil, Sweden.

(Dr Lena Gustafsson, Department of General & Marine Microbiology, Carl Skottsbergs Gata 22, S-413 19 Göteborg, Sweden.)

Heteroatom chemistry

7–12 *June*. 3rd International Conference on Heteroatom Chemistry. Riccione, Italy.



Warsaw: Venue of the International Symposium on Ring Opening Polymerization to be held in July 1992.

(Prof. A. Fava, C.N.R. — I.co-C.E.A., Via della Chimica, 8, I-40064 Ozzano Emilia-B0, Italy.)

Organic synthesis

28 *June*–2 *July*. International Conference on Organic Synthesis. Montréal, Québec, Canada.

(Prof. Jean-Claude Richer, Département de Chimie, Université de Montréal, C.P. 6128 succursale A, Montréal, Québec H3C 3J7, Canada.)

Ring opening polymerization

7–11 *July*. International Symposium on Ring Opening Polymerization. Warsaw, Poland. (R.O.P. Organizing Committee, Institute of Polymer Chemistry, Polish Academy of Science, ul. M. Curie-Sklodowskiej 34, 41–800 Zabrze, Poland.)

5th International Symposium on Solubility Phenomena

8–10 *July*. 5th International Symposium on Solubility Phenomena. Moscow, USSR. (Prof. V. M. Valyashko, N.S. Kurnakov Institute of General and Inorganic Chemistry, Leninsky Prospekt 31, Moscow, GSP-1, 117907, USSR.)

Computers in chemical research and education

12–17 *July*. 10th International Conference on Computers in Chemical Research and Education. Jerusalem, Israel.

(Professor Y. Wolman, Department of Organic Chemistry, The Hebrew University, Jerusalem 91904, Israel.)

Risk management of chemicals

13–16 *July*. International Symposium on Risk Management of Chemicals Can Chemicals be Used Safely? Guildford, UK.

(Dr J. F. Gibson, Secretary (Scientific). The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK Tel. +44 (71) 4378656.)

Macromolecules

13–18 *July*. 34th International Symposium on Macromolecules. Prague, Czechoslovakia.

(IUPAC Macro 92 Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Science, Heyrovského nám. 18882/2, 16206 Prague 6, Czechoslovakia. Tel. +42 (2) 360317. Telex 122019 IMCP C.)

Coordination chemistry

19–24 July. 29th International Conference on Coordination Chemistry. Lausanne, Switzerland.

(Prof. A. E. Merbach, Institute de Chimie Minerale et Analytique, Université de Lausanne, Place du Chateau 3, CH-1005 Lausanne, Switzerland.)

Novel aromatic compounds

19–24 July. 7th International Symposium on Novel Aromatic Compounds. Victoria, B.C., Canada.

(Dr R. H. Mitchell, Department of Chemistry, University of Victoria, Box 3055, Victoria, B.C., Canada V8W 3P6.)

Photochemistry

19–25 July. 14th International Symposium on Photochemistry. Leuven, Belgium.

(Prof. F. de Schryver, Department of Chemistry, Katholieke Universiteit Leuven, Celestijnenlaan 200F, 3001 Heverlee, Belgium.)

Exploration, mining and processing of materials

2–7 August. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Randburg, Transvaal, Republic of South Africa.

(The Symposium Secretariat, Mintek, Private Bag X3015, Randburg, 2125 South Africa. Tel. 27 (11) 7933511. Fax. +27 (11) 7932413. Telex 424867 SA.)

Macrocyclic chemistry

9–14 August. 17th International Symposium on Macrocyclic Chemistry, Provo, Utah, USA.

(Prof. R. M. Izatt, Chemistry Department, Brigham Young University, 226 Eyring Science Center, Provo, Utah 84602, USA.)

Chemical thermodynamics

16–21 August. 12th International Conference on Chemical Thermodynamics (ICCT). Utah, USA.

(Prof. E. M. Woolley, Department of Chemistry, Brigham Young University, Provo, Utah 84602, USA.)

Biotechnology

16–21 August. 9th International Biotechnology Symposium. Crystal City, Virginia, USA.

(Dr D. I. C. Wang, Chevron Professor of Chemical Engineering, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA.)

Natural products

30 August–4 September. 18th International Symposium on Natural Products. Strasbourg, France.

(Prof. G. Ourisson, Centre de Neurochimie, 5 rue Blaise Pascal, F-67084 Strasbourg, France. Tel. +33 88600513. Fax. +33 88607620. Telex ULP 870260f.)

Macrocyclic ligands

13–15 September. International Symposium on Macrocyclic Ligands for the Design of New Materials. Guildford, Surrey, UK. (Dr Angela F. Danil de Namor, Chemistry Department, University of Surrey, Guildford GU2 5XH, Surrey.)

Organic substances in soil and water

14–17 September. International Conference on Organic Substances in Soil and Water. Lancaster, UK.

(Miss C. Martin, Centre for Research on Environmental Systems, Institute of Environmental and Biological Sciences, University of Lancaster, Bailrigg, Lancaster LA1 4YQ, UK. Tel. +44 (524) 6520. Fax. +44 (524) 843854.)

Analytical chemistry

20–26 September. SAC 92: International Conference on Analytical Chemistry. Reading, UK.

(The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

1993

Boron chemistry

11–15 July. 8th International Meeting on Boron Chemistry (IMBERON VIII), Tennessee, USA. (Prof. G. W. Kabalka, Director of Basic Research, The University of Tennessee, Biomedical Imaging Center, 575 Buehler Hall, Knoxville, Tennessee 37996-1600, USA.)

Bioorganic chemistry

7–10 June. 2nd International Symposium on Bioorganic Chemistry. Fukuoka, Japan. (Prof. Yukito Murakami, Department of Organic Synthesis, Faculty of Engineering, Kyushu University, Hakozaki, Higashi-ku, Fukuoka 812, Japan.)

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than 3 months in advance. If a visa is not granted 1 month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

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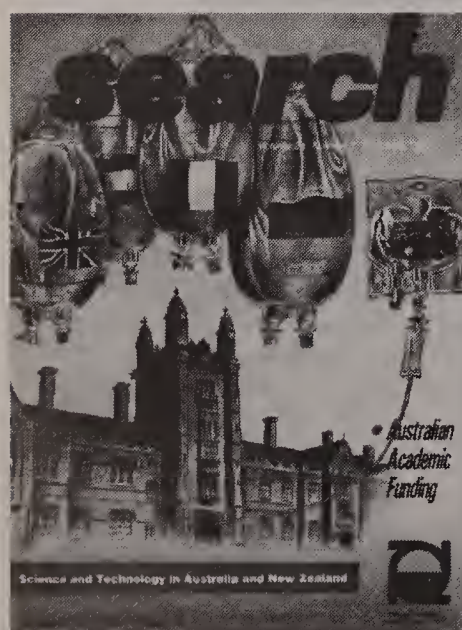
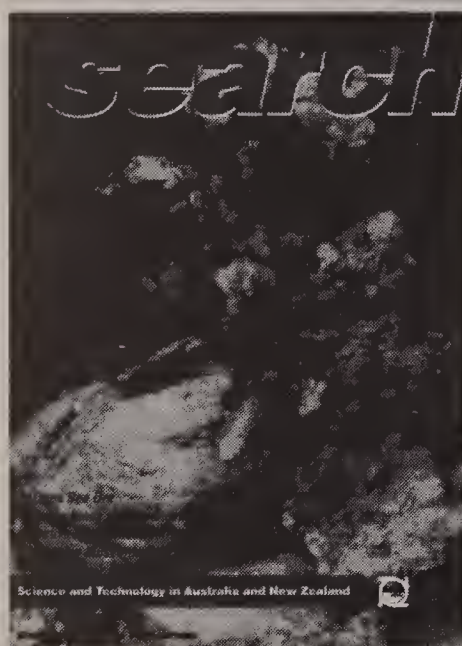
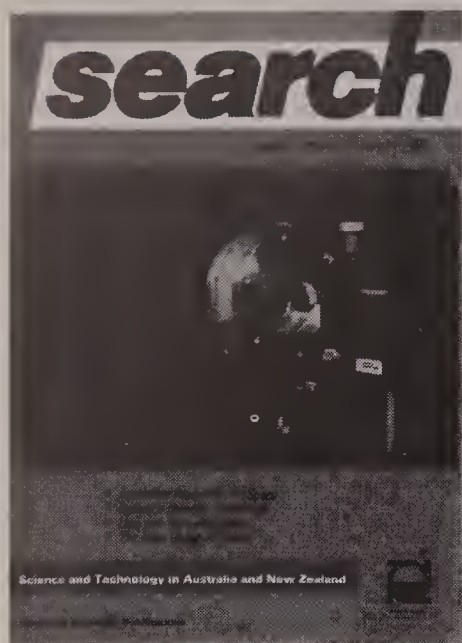
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- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

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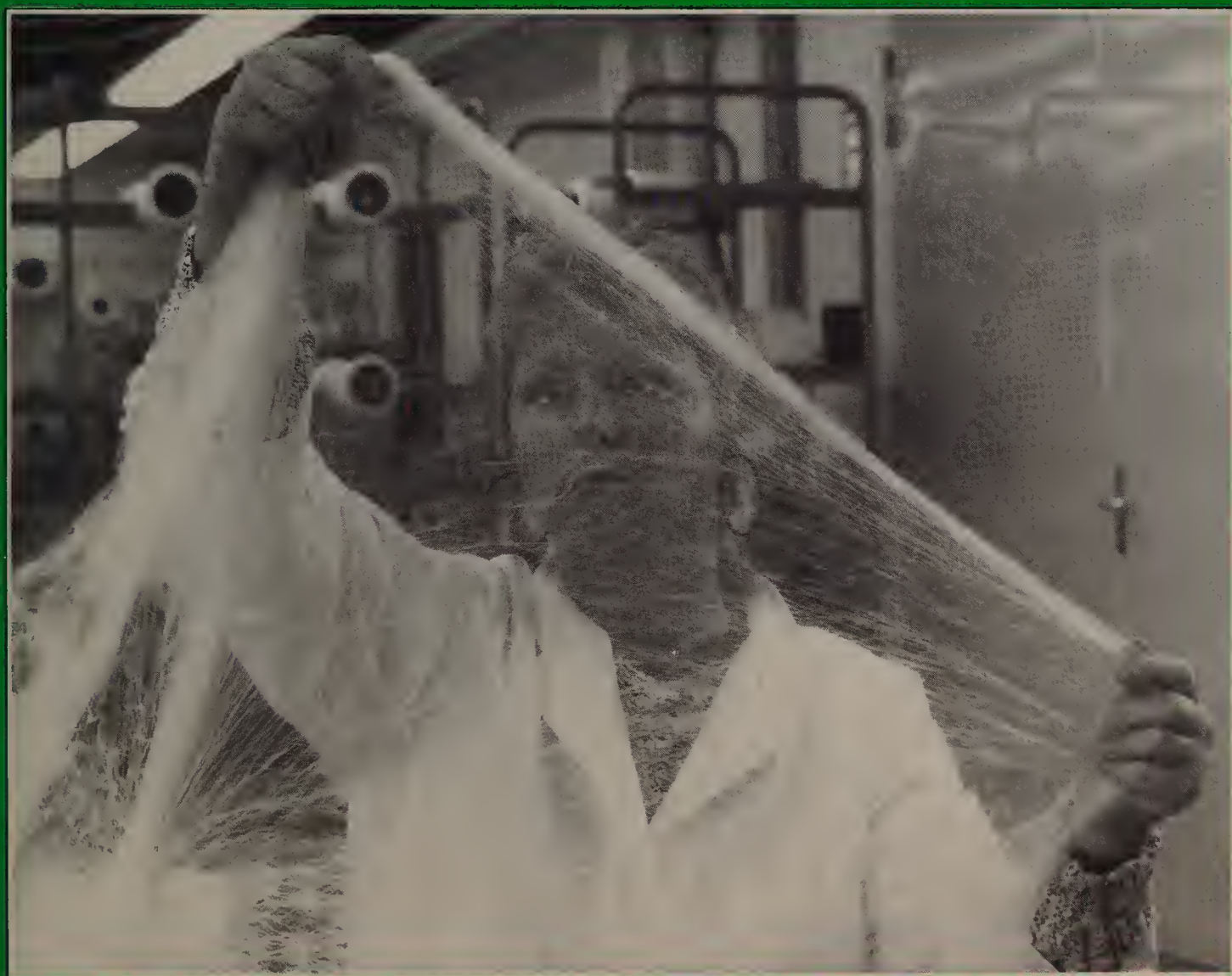
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Six issues of *Chemistry International* will be published in 1992. The 1992 subscription rate including postage is GBP 48.50 (UK), GBP 48.50 (overseas except North America) USD 82.50 (US and Canada). The individual subscription rate is GBP 24.00, USD 36.50. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Blackwell Scientific Publications Ltd, Journal Subscriptions Department, Marston Book Services, PO Box 87, Oxford, UK.

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Despatch. The news magazine is despatched within Europe by surface mail, to other continents by various forms of air speeded delivery: to the US* by air freight for forwarding by second class post, to India by air freight for guaranteed local delivery, and to all other countries by Accelerated Surface Post.

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Front cover: Examination of fibre in the laboratory of a textile mill in Berlin, Germany. (*Photo courtesy Hoechst AG*)

Each year, IUPAC Executive Secretary Dr Maurice Williams prepares a report on IUPAC activities for the International Council for Scientific Unions (ICSU). The following is his 1990 report.

For IUPAC, 1990 was a non-general assembly year. The business of the Union was conducted through meetings of the Executive Committee (Athens, April) and the Bureau (Triuggio/Milan, September).

Belgium ceased to be a member of the Union because of arrears in its annual subscription, and Associated Organization status was withdrawn from the Association of Faculties of Science of African Universities — Chemistry Committee because it failed to submit a current activities report.



The Bureau met in Triuggio, Milan in September.

Significant progress was made in restructuring of the Union. A coordinating committee for the first of the new mission-orientated programmes — Chemistry and the Environment — met twice, and disseminated widely a booklet on *Chemistry and the Environment: The IUPAC Programme*. This booklet was well received, and it constitutes a basis for involvement of IUPAC in existing international environmental activities with organizations such as UNEP and ICSU-SCOPE.* A positive outcome is that IUPAC is now assisting with SCOPE-RADPATH's book on *Biogeochemical Pathways of Artificial Radionuclides*. A planning meeting was held for the second mission-orientated programme — Chemistry and Advanced Materials.

The restructured IUPAC Finance Committee also met for the first time. A major refurbishment of the IUPAC Secretariat offices at Oxford was undertaken, including the computerization of accounts there instead of such work being undertaken by the Union's banker.

The biennial critical assessment of IUPAC projects and programmes contained a number of recommendations, which will be examined critically by the higher authorities of the Union during 1991. These include the controversial amalgamation of several existing commissions in order to increase the flexibility in funding the new mission-orientated programmes.

A major initiative during September at Basel was the highly successful 1st IUPAC Workshop on Safety in Chemical Production. A second workshop is planned for Yokohama, Japan in 1993, dealing with environmental aspects of the subject, after which other workshops will be organized in developing countries. In addition, the Committee on Chemistry and Industry produced an attractive brochure on *Industry and IUPAC*.

The Phase (i) report of the IUPAC-IUPAP* Transferrmium Working Group — *Criteria That Must Be Satisfied for Discovery of a New Chemical Element To Be Recognized* — was approved for publication by the two Unions. The working group is now applying these criteria with respect to conflicting claims over the past several years for discovery of various transferrmium elements.

A supplemental agreement for the years 1990 and 1991, augmenting the existing agreement with Blackwell Scientific Publications, was signed. A significant outcome was the appearance of *Nomenclature of Inorganic Chemistry: Recommendations 1990* (effectively Part I of an enlarged version of the 1970 edition of The Red Book). In conjunction with BSP, the Union also issued its first chemical database — *ENTVAPOR*, recommended values of enthalpies of vaporization for some 600 organic compounds — as an executable file, which can be run under MS-DOS or PC-DOS on IBM-compatible personal computers with at least 512K of RAM. Good progress has been made in developing a valuable database of IUPAC reports published in its official journal, *Pure and Applied Chemistry*, since its inception in 1960. IUPAC adopted a recommendation henceforth to have

*ICSU-SCOPE International Council of Scientific Unions — Scientific Committee on Problems of the Environment.

*IUPAP International Union of Pure and Applied Physics.

*UNEP United Nations Environment Programme.

dBASE III as the retrieval software and the data in ASCII format. This should make IUPAC database projects economical and the data easily transferable to other computers.

The total membership of the IUPAC Affiliate Membership Programme for 1990 (7464 from 82 countries) was down on that for 1989 (8006). The new Committee on Affiliate Membership, formed from within the Bureau, met for the first time. Efforts are being made to provide some additional benefits and incentives for affiliates, and to encourage their election to membership of IUPAC bodies where they have relevant expertise.

Appendix

The following recommendations on nomenclature and symbols were published in 1990:

1. Commission on Analytical Nomenclature. Nomenclature for sampling in analytical chemistry (Recommendations 1990). *Pure Appl. Chem.*, Vol. 62, pp. 1193–1208, 1990.
2. Commission on Atmospheric Chemistry. Glossary of Atmospheric Chemistry Terms (Recommendations 1990). *Pure Appl. Chem.*, Vol. 62, pp. 2167–2219, 1990.
3. Commission on Nomenclature of Inorganic Chemistry. *Nomenclature of Inorganic Chemistry (Recommendations 1990)*. Blackwell Scientific Publications, Oxford, 1990.

The following technical reports by IUPAC bodies were published during the year:

1. Commission on Electroanalytical Chemistry. Recommended methods for the purification of solvents and tests for impurities: 1,2-ethanediol and 2,2,2-trifluoroethanol. *Pure Appl. Chem.*, Vol. 62, pp. 139–147, 1990.
2. Interdivisional Working Party on Harmonization of Quality Assurance Schemes for Analytical Laboratories. Harmonized protocols for the adoption of standardized analytical methods and for the presentation of their performance characteristics. *Pure Appl. Chem.*, Vol. 62, pp. 149–162, 1990.
3. Commission on Atmospheric Chemistry. Inventory of current tropospheric sampling programs. *Pure Appl. Chem.*, Vol. 62, pp. 163–176, 1990.
4. Commission on Agrochemicals. Mass spectrometric determination of pesticide residues (IUPAC reports on pesticides no. 25). *Pure Appl. Chem.*, Vol. 62, pp. 317–336, 1990.
5. Commission on Agrochemicals. The prediction of pesticide residues in crops by the optimum use of existing data (IUPAC reports on

pesticides no. 26). *Pure Appl. Chem.*, Vol. 62, pp. 337–350, 1990.

6. Commission on Agrochemicals. The role and limitations of microorganisms, in the conversion of xenobiotics (IUPAC reports on pesticides no. 27). *Pure Appl. Chem.*, Vol. 62, pp. 351–364, 1990.
7. Commission on Teaching of Clinical Chemistry. Training in clinical laboratory management (Guidelines 1988). *Pure Appl. Chem.*, Vol. 62, pp. 365–372, 1990.
8. Commission on Biotechnology. Interrelations of chemistry and biotechnology — I. Biotransformation — a useful tool in organic chemistry. *Pure Appl. Chem.*, Vol. 62, pp. 753–768, 1990.
9. Commission on Biotechnology. Interrelations of chemistry and biotechnology — II. Microbial degradation of synthetic recalcitrant compounds. *Pure Appl. Chem.*, Vol. 62, pp. 769–779, 1990.
10. Commission on Oils, Fats and Derivatives. Determination of ester-emulsifiers components content after hydrolysis and silylation by gas chromatography. Results of a collaborative study and the standardised method. *Pure Appl. Chem.*, Vol. 62, pp. 781–793, 1990.
11. Commission on Oils, Fats and Derivatives. Determination of *n*-3 and *n*-6 unsaturated fatty acids in vegetable oils and fats by capillary gas liquid chromatography. Results of a collaborative study and the standardised method. *Pure Appl. Chem.*, Vol. 62, pp. 795–802, 1990.
12. Commission on Electroanalytical Chemistry. Thermodynamic functions of transfer of single ions from water to non-aqueous and mixed solvents (based on an extrathermodynamic



One of IUPAC's technical reports published during the year was concerned with the present and future status of organic analytical reagents.

The Institute of Macromolecular Chemistry in Prague was the venue of the 13th Discussion Conference on Mechanisms of Polymer Strength and Toughness.



assumption): Part 5 — Gibbs energies of transfer into aqueous alcohols. *Pure Appl. Chem.*, Vol. 62, pp. 889–940, 1990.

13. Commission on Radiochemistry and Nuclear Techniques. Total half-lives for selected nuclides. *Pure Appl. Chem.*, Vol. 62, pp. 941–958, 1990.

14. Commission on Radiochemistry and Nuclear Techniques. Information on training in radiochemistry and nuclear techniques. *Pure Appl. Chem.*, Vol. 62, pp. 959–1002, 1990.

15. Commission on High Temperature and Solid State Chemistry. Quantitative analysis of a multicomponent silicate glass by electron microprobe. *Pure Appl. Chem.*, Vol. 62, pp. 1187–1192, 1990.

16. Commission on Photochemistry. Recommended methods for fluorescence decay analysis. *Pure Appl. Chem.*, Vol. 62, pp. 1631–1648, 1990.

17. Commission on Electrochemistry. Polarographic half-wave potentials of cations in nonaqueous solvents. *Pure Appl. Chem.*, Vol. 62, pp. 1839–1858, 1990.

18. Commission on Polymer Characterization and Properties. The study of microstructures of poly(vinyl alcohol) by NMR. *Pure Appl. Chem.*, Vol. 62, pp. 2139–2146, 1990.

19. Commission on General Aspects of Analytical Chemistry. Present and future status of organic analytical reagents — Part I. General remarks. *Pure Appl. Chem.*, Vol. 62, pp. 2147–2166, 1990.

20. Commission on Molecular Structure and Spectroscopy & Colloid and Surface Chemistry including Catalysis. A survey of experimental techniques in surface chemical physics. *Pure Appl. Chem.*, Vol. 62, pp. 2297–2322, 1990.

21. Commission on General Aspects of Analytical Chemistry. Present and future status of organic analytical reagents — Part II. Inorganic chemical analysis: classical methods, molecular spectroscopy (absorption and emission) and solvent extraction. *Pure Appl. Chem.*, Vol. 62, pp. 2323–2338, 1990.

22. Commission on Oils, Fats and Derivatives. Determination of the iodine value of oils and fats: results of a collaborative study. *Pure Appl. Chem.*, Vol. 62, pp. 2339–2343, 1990.

23. Commission on Thermodynamics. *International Thermodynamic Tables of the Fluid State*, Vol. 11. *Fluorine*, Blackwell Scientific Publications, Oxford, 1990.

24. Commission on Electroanalytical Chemistry. *Acid–Base Dissociation Constants in Dipolar Aprotic Solvents*. Blackwell Scientific Publications, Oxford, 1990.

25. Commission on Solubility Data. *Solubility Data Series*, Vol. 43. *Carbon Monoxide*. Pergamon Press, Oxford, 1990.

26. Commission on Solubility Data. *Solubility Data Series*, Vol. 44. *Copper and Silver Halates*. Pergamon Press, Oxford, 1990.

Thirty-two symposia were sponsored by IUPAC in 1990, namely:

1. 17th International Symposium on the Chemistry of Natural Products, New Delhi/India, February. *Pure Appl. Chem.*, Vol. 62, No. 7, 1990.
2. 4th International Symposium on Biological and Environmental Reference Materials (BERM-4),

- Orlando, Florida/USA, February. *Fresenius' Analyt Chem*, Vol. 338, No. 4, 1990.
3. 2nd International Symposium on Characterization of Porous Solids, (COPS-2), Alicante/Spain, May. Proceedings to be published by Elsevier, Amsterdam, 1991.
 4. 9th International Symposium on Carotenoids, Kyoto/Japan, May. *Pure Appl. Chem.*, Vol. 63, No. 1, 1991.
 5. 10th International Symposium on Polymer Networks, Jerusalem, Israel. *Makromol Chem. Macromol. Symp.*, Vol. 40, in press, 1990.
 6. International Symposium on Unsteady State Processes in Catalysis (USPC), Novosibirsk/USSR, June. Proceedings to be published by VSP, Utrecht, 1990.
 7. International Symposium on Trace Elements in Health and Disease, Helsinki/Finland, June. Proceedings to be published, by Royal Society of Chemistry, London, 1991.
 8. 7th World Ceramic Congress, Montecatini Terme/Italy, June. Proceedings to be published by Elsevier Science Publishers, Amsterdam, 1991.
 9. 33rd IUPAC Symposium on Macromolecules, Montreal/Canada, July. *Pure Appl. Chem.*, in press.
 10. 13th Discussion Conference on Macromolecules, Mechanisms of Polymer Strength and Toughness, Prague/Czechoslovakia, July. *Makromol. Chem. Macromol. Symp.*, in press.
 11. 13th International Symposium on Photochemistry, Warwick, Coventry/UK, July. *Pure Appl. Chem.*, Vol. 62, No. 8, 1990.
 12. 3rd International Symposium on Polymer Analysis and Characterization, Brno/Czechoslovakia, July. *J. Appl. Polymer Sci.*, in press.
 13. 8th International Conference on Organic Synthesis, Helsinki/Finland, July. *Pure Appl. Chem.*, Vol. 62, No. 10, 1990.
 14. 7th International Meeting on Boron Chemistry — IMEBORON VII, Torun/Poland, July/August. *Pure Appl. Chem.*, Vol. 63, No. 3, 1991.
 15. 4th International Symposium on Solubility Phenomena, Troy, NY/USA, August. *Pure Appl. Chem.*, Vol. 62, No. 11, 1990.
 16. 7th International Congress of Pesticide Chemistry, Hamburg, Germany, August. Proceedings to be published by VCH, Weinheim, 1991.
 17. 10th International Conference on Physical Organic Chemistry, Haifa/Israel, August. *Pure Appl. Chem.*, Vol. 63, No. 2, 1991.
 18. 21st International Conference on Solution Chemistry, Ottawa/Canada, August. *Pure Appl. Chem.*, Vol. 62, No. 12, 1990.
 19. 15th International Carbohydrate Symposium, Yokohama/Japan, August. *Pure Appl. Chem.*, Vol. 63, No. 4, 1991.
 20. 12th International Conference on Raman Spectroscopy, Columbia, SC, USA, August. Proceedings to be published by John Wiley, New York, 1990.
 21. 28th International Conference on Coordination Chemistry, Jena, Germany, August. *Pure Appl. Chem.*, Vol. 63, No. 5, 1991.
 22. 14th International Conference on Organometallic Chemistry, Detroit, MI, USA, August. *Pure Appl. Chem.*, in press.
 23. 11th IUPAC International Conference on Chemical Thermodynamics, Como, Italy, August. *Pure Appl. Chem.*, in press.
 24. 14th International Symposium on the Organic Chemistry on Sulfur, Lodz/Poland, September. In: *Phosphorus, Sulfur and Silicon*. Gordon & Breach, New York, 1991.
 25. 11th International Symposium on Medicinal Chemistry, Jerusalem, Israel, September. Proceedings to be published by Blackwell Scientific Publications, Oxford, 1991.
 26. 1st IUPAC Workshop on Safety in Chemical Production, Basel, Switzerland, September. Proceedings to be published by Blackwell Scientific Publications, Oxford, 1991.
 27. International Symposium on Mechanisms and Kinetics of Polymerization Reactions: Their Use in Polymer Synthesis, Paris, France. *Makromol. Chem. Macromol. Symp.*, in press.
 28. 4th International Colloquium on Solid Sampling with Optical Atomic Spectroscopy, Jülich, FRG, October. *Pure Appl. Chem.*, in press.
 29. 4th International Congress on Automation and New Technology in the Clinical Laboratory, Barcelona/Spain, October. *Pure Appl. Chem.*, in press.
 30. International Symposium and Workshop on Food Safety — Mycotoxins and Phycotoxins, Cairo/Egypt, November (No decision taken yet re publication in view of less-than-expected attendance).
 31. 19th Congreso Latinoamericano de Quimica, Buenos Aires/Argentina, November. *Pure Appl. Chem.*, in press.
 32. International Symposium on Speciality Polymers, Singapore. *Makromol. Chem. Macromol. Symp.*, in press.

The Keita project

The Food and Agriculture Organization of the United Nations (FAO) has published an attractive booklet on the Keita Integrated Development Project in The Republic of Niger. The booklet is illustrated with colour photographs.

The Republic of Niger is the largest country in western Africa. Land-locked, it shares borders with Algeria and Libya to the north, Nigeria and Benin to the south, Mali and Burkina Faso to the west and Chad to the east. Much of the land lies in the arid Sahara desert and 75% receives an average annual rainfall of less than 250 mm. Nearly 90% of the working population is engaged in growing crops or raising livestock, although agriculture accounts for only half of the gross domestic product. Recurring drought and pest invasions as well as economic obstacles have thwarted the attainment of lasting food self-sufficiency.

Niger is divided into seven departments which are subdivided into 35 districts. It has a population of about 7 million with an annual growth rate of 2.8%. A slump in the world uranium market and consequent austerity measures have led to a severe financial crisis. The Keita district was targetted for a sustainable development programme as part of the Nigerian government's strategy to restore the country's agricultural base and infrastructure.

The Keita District totals 4860 km² of plateaux, rocky slopes, sandy and sloping plains, and valleys dissected by a network of rainy-season waterways known as *koris*. The agreement between FAO and the governments of Niger and Italy was signed in December 1983 to reverse the trends of land degradation and desertification. The plateaux and sloping plains that were deemed barren or low-potential have now been planted with trees, crops and grass. Apart from boosting agricultural yields



Sustainable development in Niger, 1990: Keita women (above) at a regional fair display processed goods. They sell grated cassava, bottled tomato purée and will soon offer sunflower oil. Check dams (top right) with these locally produced building blocks will gradually raise the beds of the *koris*, slowing erosion while supplying additional groundwater. The meteorological centre (centre right) keeps a vigilant watch over rainfall — personnel make daily readings and record data. As desertification spread, herdsmen were forced to travel greater distances in search of scarce pasture (bottom right). Much of the recovered plateaux has been reserved for animal forage. (FAO photos by F. Paladini.)

and restoring rangelands, the project has also put in place better roads, schools and social services.

According to Edouard Saouma, Director-General of FAO, the people of Keita have, in just 5 years, transformed their district from a barren landscape unable to meet basic food requirements to a flourishing environment for crops and livestock. The Keita project has put into practice FAO's objectives for integrated, sustainable development.

From the start, people's participation has been the main vehicle for action. The local community has participated in decision-making, planning and executing all the project activities from watershed management, soil conservation and afforestation to improving crop production, infrastructure and social services.

The role of women in the project has been crucial, indeed they made up 95% of the workforce at first. Each small step from planting a tree to drilling a well, has directly benefited women and their families. Children have been engaged not only in the classroom but in tree planting and other exercises that prepare them to become tomorrow's farmers and conversationists.

The FAO publication covers a wide range of Keita project activities: land and water conservation; crop production; women — work, nutrition, child care; appropriate technology; children and schools; reafforestation; and animal production.

For further information about FAO and the Keita project please contact: Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 – Rome, Italy.

We regret to record the deaths of

Prof. A. Bruylants, Belgium (12 July 1990) — Belgian Delegation to Council (1971, 1973, 1975, 1977).

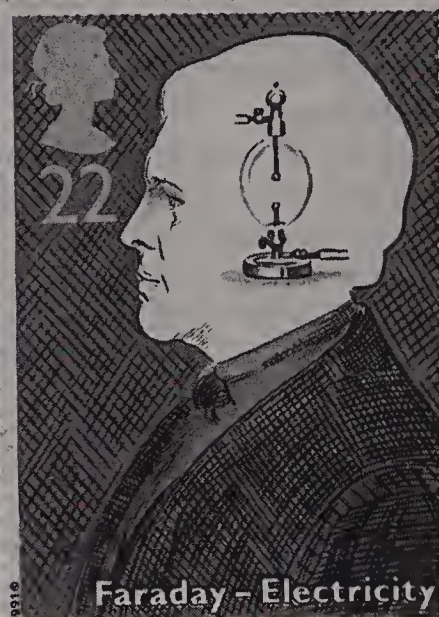
Prof. Marjorie Gardner, USA (19 April 1991) — Committee on Teaching of Chemistry (1981–1990).

Prof. H. A. Laitinen, USA (22 March 1991) — Commission on Electroanalytical Chemistry (1955–59, 1961–65, 1969–71), Commission on Physicochemical Data of Analytical Interest/Sub-Commission on Polarographic Data (1951–55)

Prof. E. Rancke-Madsen, Denmark (22 October 1987) — Committee on Teaching of Chemistry (1970–85)

Michael Faraday anniversary

The British chemist and physicist Michael Faraday was born in Newington, Surrey, in 1791. He is known for his pioneering experiments in electricity and magnetism. Some people consider Faraday to be the greatest experimentalist ever.



Michael Faraday was President of the Royal Society. This British stamp celebrates his pioneering experiments in electricity.

He received relatively little education. At the age of 14 he became an apprentice bookbinder. He soon became interested in science and after hearing a lecture by the famous chemist Humphrey Davy he wrote to him sending him the notes he made during the lecture. Davy appointed him as a laboratory assistant at the Royal Institution in London. Faraday was then 21.

During the years that followed, Faraday discovered two new chlorides of carbon. He also succeeded in liquefying chlorine and other gases. In 1825 he isolated benzene and in the same year was appointed Director of the laboratory. Following years of experimentation on electrolysis, he finally formulated his famous laws of electrolysis in 1834. By that time he had already discovered the phenomenon of electromagnetic induction.

Faraday became President of the Royal Society and wrote several books including *Experimental Researches in Chemistry and Physics* (1858). In 1855, after suffering loss of memory, he ceased his research. He died in 1867.

Guidelines for authors

New authors wishing to contribute to *Chemistry International* are asked to consult the 'Guidelines for authors' published on pages 8–9 of the January 1991 issue of the magazine. Please contact the editor if you require a copy of these guidelines.

Transfermium elements

Readers with a long memory will recall that the September 1989 issue of *CI* published a report on 'Transfermium elements' (*CI*, Vol. 11, No. 5, pp. 180–2, 1989). The Report outlined the background to the work of the joint IUPAC–IUPAP (International Union of Pure and Applied Physics) Transfermium Working Group (TWG). IUPAC members of TWG were IUPAC President Yves Jeannin and Prof. Norman Greenwood (President of the Inorganic Chemistry Division from 1977 to 1981).

The Report on Phase (i) of operations of TWG has now been published (*PAC*, Vol. 63, No. 6, pp. 887–

893, 1991). The report enumerates various characterization properties and assignment properties that are relevant to the discovery of new elements having atomic numbers greater than 100. TWG has not referred specifically to earlier publications in this field. Jeannin's preface to this report is published on page 241 of this issue of *CI*.

In Phase (ii), TWG will apply these ideas so as to develop discovery profiles for each of the individual transfermium elements. In the Phase (ii) Report, TWG will refer in detail to all relevant publications on those elements and also mention earlier reviews dealing with the discovery of the transfermium elements.

Letter to the Editor

SI units and the mole

Sir,

Recently, quantities related to atomic, molecular, and molar masses, as well as the definition of the SI base unit, the mole, have been subjects of letters to you^{1–4}. In this letter, I would like to readdress these issues primarily by exploring the relationships between quantities associated with a sample of substance.

Thornley and Johnson¹ advocated that the unit mole should be redefined in relation to 12 kg of carbon 12, instead of 12 g. They argue that the usage of the unit mole as presently defined is unsatisfactory, especially because it leads to molar masses more easily expressed in grams per mole. However, I think that it is much more straightforward, and simpler for everyone, whenever more convenient (as it seems to be the case in sciences such as plant and crop physiology¹), to consider expressing molar masses in kilograms per kilomole. Although the International Organization for Standardization (ISO) recommends that only one prefix be used in forming a multiple of a compound SI unit⁵, this rule does not apply when the unit kilogram is involved; thus, ISO points out⁶ that kg/kmol is one of the possible units for molar mass, as well as kg/mol and g/mol. [Contrary to what some chemists believe (as exemplified by a statement by Holden⁴), g/mol is as acceptable a unit for molar mass as kg/mol (or kg/kmol).] Here, paraphrasing Thornley and Johnson¹, may be recalled that a concentration of 1 mol/L is equivalent to 1 kmol/m³.

Before addressing other points, I would like to recall some of the relationships between quantities

associated with a sample of substance. The two most commonly recognized intrinsic properties of samples of matter are mass and volume (in fact, matter is usually defined as 'anything that has a mass and occupies space'). The number of entities in a sample of matter is another of its intrinsic properties (these entities may be either atoms, molecules or formula-units, or any possible combination of the three). A fourth intrinsic property of samples of matter is amount of substance (the definition of its unit, the mole, is directly based on a specific number of entities, that of atoms in 12 grams of carbon 12). Hence, at least four quantities can be associated with a sample of a substance: a mass m (unit: kg), a volume V (unit: m³), an amount of substance n (unit: mol), and a number N of entities (no unit, dimensionless). All of these quantities are extensive, i.e. their value depends on the size of the sample. On the other hand, since these quantities are intrinsic to the sample, they are all directly proportional to one another. The resulting proportionality relationships involve particular proportionality constants, as dictated by quantity calculus (a cornerstone underlying the *Système International d'Unités* – SI). Each of these proportionality constants is an intensive property of the sample, that is, a property whose value is independent of the size of the sample. The most commonly used relationships between m , V , n and N are:

$$m = \rho \times V, \quad (1)$$

$$V = v \times m, \quad (2)$$

$$m = M \times n, \quad (3)$$

$$V = V_m \times n, \quad (4)$$

$$N = N_A \times n, \quad (5)$$

where the respective proportionality constants are: ρ = mass density (unit: kg/m³); v = specific volume (unit: m³/kg); M = molar mass (unit: kg/mol); V_m = molar volume (unit: m³/mol); and N_A = Avogadro's constant (unit: mol⁻¹). The definition of each of these proportionality constants arises naturally from the corresponding equation; for instance, M is the mass per unit amount of the substance, N_A is the number of entities per unit amount of the substance, just as ρ is the mass per unit volume of the samples. (Note that because V is a function of temperature and pressure, the quantities ρ , v and V_m are also functions of temperature and pressure.)

Nelson² discussed the difficulty that students have to differentiate 'between the relative mass of an entity, M_r (= 18.02 for H₂O), and its molar mass (=18.02 g/mol for H₂O)'. Toby³, although not in a correct way (see Holden⁴), also pointed out the difficulty of using relative masses, i.e. dimensionless masses. Hereinafter I show that, according to quantity calculus, relative masses are quantities that cannot be logically intermingled with the mass of a sample of a substance, the number of entities in the sample, or even the substance's molar mass; consequently their use should be discouraged. For this, I would like to recall the seldom-used relationship between the mass m of a sample and the number N of entities contained in it:

$$m = m_e \times N, \quad (6)$$

where the proportionality constant m_e is the mass per entity (unit: kg). By combining this relationship with relationships 3 and 5 above, one obtains:

$$M = N_A \times m_e. \quad (7)$$

The application of quantity calculus to both relationships 6 and 7 clearly shows that m_e must have the dimensions of mass, that is the mass of the entity cannot be considered a relative mass. Thus, the so-called 'relative atomic mass'⁷ and 'relative molecular mass',⁸ as well as the 'standard molar mass',⁷ are red herrings that should be altogether dispensed with as somewhat proposed by Toby³. Then, considering that atomic masses are usually expressed in unified atomic mass units and molar masses in, for instance, kilograms per mole, the only minor difficulty left for students is the conversion of one unit of mass into another, i.e. from atomic mass units to kilograms, and vice versa.

At this point it might be useful to recall that Avogadro's number N_0 and Avogadro's constant N_A are different: $N_A = N_0 \text{ mol}^{-1}$ (this seems to have not been apprehended by Thornley and Johnson¹, who in their letter state that a mole contains N entities and that the units of N are mol⁻¹). It might also be recalled that, as deduced from the definitions of N_0 (the number of atoms in 12 g of carbon 12) and of

the unified atomic mass unit,⁹ the relationship between gram (g) and atomic mass unit (u) is intermediated by Avogadro's number, i.e. $1\text{g} = N_0\text{u}$. This relationship, used along with equation 7, allows students to understand easily why the number of atomic mass units weighed by a water molecule is the same as the number of grams per mole in the molar mass of water.

Up to now, the existence of N_0 has not been clearly acknowledged by IUPAC, as pointed out previously by Lybeck *et al.*⁹ This may be understandable if IUPAC is trying to avoid the possible confusion caused by having the name Avogadro associated with two different quantities. However, I believe it is important that IUPAC officially acknowledges the existence of N_0 . To facilitate this, I have suggested elsewhere¹⁰ that N_0 be renamed as the Nier-Ölander number, because the actual value of this number is a direct result of Nier's and Ölander's independent suggestions that carbon 12 were adopted as the reference nuclide.¹¹ The adoption of this name would lessen the possibility of confusion between N_0 and N_A , which would be of great pedagogical value. I encourage those readers of *Chemistry International* that agree with this last suggestion to write to IUPAC in support of it.

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Information for affiliates

Free copies of booklet available to affiliates

Copies of an attractive 64-page illustrated booklet on *The IUPAC Programme on Chemistry and the Environment* have been distributed to members of IUPAC commissions and committees, national adhering organizations and other bodies associated with IUPAC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Secretary.

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC commissions. A full list of names and addresses of all commission officers for 1991–93 are published on pages 223–233 of this issue of *CI*.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International*, please indicate that the letter is 'Submitted for publication in *CI*.'

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2–3 Pound Way
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Oxford OX4 3YF
UK

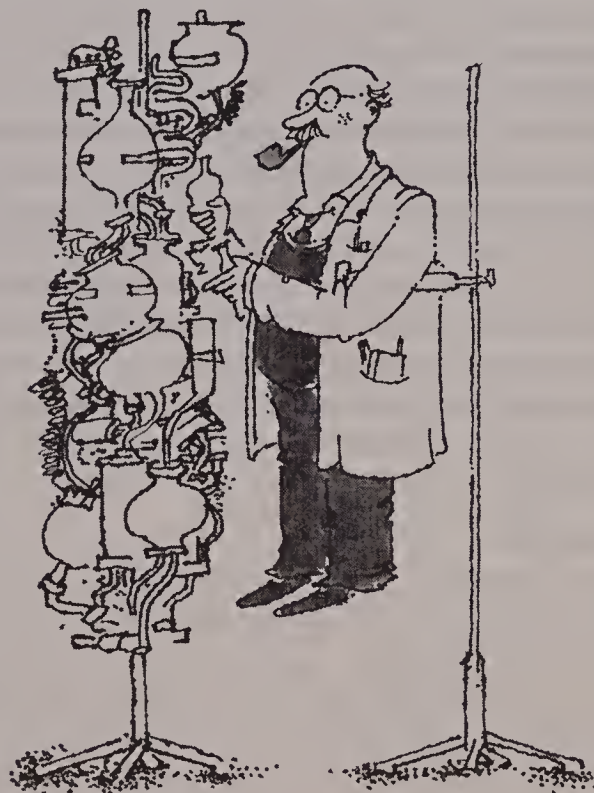
Tel: +44 (865) 747744
Fax: +44 (865) 747510
Telex: 83220 IUPAC G

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually, but not always, announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal.



Stand-up chemist

Czech affiliate Dr M. Jankovsky kindly sent us a postcard from Prague with the above cartoon on it. The cartoon is credited, on the back of the postcard, to Kresba Vladimir Renčin/Tisk Seerografia Děčín. We would welcome further humorous contributions to the magazine from affiliates.

Jankovsky became an IUPAC affiliate in 1987 and has registered specific interests in biotechnology and the nomenclature of organic chemistry.

Introduction of genetically modified organisms into the environment

There has been a continuing concern regarding the potential consequences of the release of genetically engineered organisms into the environment. SCOPE Report 44 *Introduction of genetically modified organisms into the environment* first views the history of concerns regarding genetic manipulation in general and then examines the genetic, population, and ecological dimensions of the release issue. Finally, approaches to assessing risks and setting safety standards are given.

The overall view is international in scope and brings together a variety of disciplinary approaches to the problem. A principal conclusion of the book is that the environmental introduction of any organisms, modified or unmodified, should be undertaken within a framework that maintains appropriate safeguards for the protection of environmental and human health while not discouraging innovation.

SCOPE 44 is the outcome of a meeting to consider these issues, attended by specialists in molecular biology, population genetics, and ecology. The meeting was held in Bellagio, Italy, in September 1987, and was co-sponsored by SCOPE and the Scientific Committee on Genetic Experimentation (COGENE). A Joint SCOPE-COGENE Statement arising from the meeting appears in this report. Excerpts appeared on pages 125-6 of the July 1988 issue of *CI*. The following is the full text of the statement.

Introduction

Genetic change is a fundamental biological phenomenon and is the basic process of evolution. It has been exploited by humans for this own purposes throughout history. Recent methodological developments, such as advances in the application of recombinant DNA (rDNA) techniques, have expanded these capabilities and provide the opportunity for addressing a wide variety of pressing human needs including solutions to environmental problems. Efforts to reduce pollution, to combat microbial infection, and to improve food production may require applications that involve the large-scale introduction of genetically modified organisms into the environment.

Any human intervention into the environment carries an element of risk. The natural response to this uncertainty is to proceed cautiously, but one

must weigh any risks that might attend the implementation of the methodology against the benefits and against any risks that might be associated with delaying implementation.

The environmental introduction of any organisms, modified or unmodified, should be undertaken within a framework that maintains appropriate safeguards for the protection of the environment and human health while not discouraging innovation. This implies that an ecological perspective is essential to the assessment of risks associated with any introduction.

There is considerable experience in the introduction of organisms into the environment. Familiar examples include vaccines, agricultural varieties, and biological control. The positive and negative lessons learned from these experiences provide a basis for the rational development of safeguards. Nevertheless, there is much that still needs to be known about such topics as systematics; community structure; the factors governing the survival, growth, and spread of populations of introducing organisms; and techniques for monitoring.

The development of new techniques also opens up new and exciting vistas for basic research, many of them involving close collaboration between molecular biologists, ecologists, and evolutionists. The new techniques will help us to understand the genetic structure of populations and to develop improved methods in applied ecology; ecological and epidemiological perspectives may serve to elucidate fundamental theoretical aspects of molecular biology, such as the population biology of plasmids and transposable elements.

Risks

In view of the great potential of new technologies for addressing environmental and other problems, and because most introductions of modified organisms are likely to represent low or negligible ecological risk, generic arguments against the use of new genetic methodologies must be rejected. Indeed, the spectrum of available tools represents an evolving and expanding continuum, which includes conventional methods, rDNA techniques, and others. While much attention has been focused on the methods used to modify organisms, it is the products of these technologies and the uses to which they will be put that should be the objects of attention, rather than the particular techniques employed to achieve those ends.



'As the ability to manipulate our environment increases, so must an awareness of these problems and of the need to exercise our power wisely.' (Photo: UNESCO/D. Roger)

Similarly, one must reject generic safety arguments based on the assertion that all introductions must have occurred some time during the course of evolution. Therefore, each introduction of an organism, whether modified or not, must be judged on its own merits, within the context of the scale of the application and the possible environmental costs and benefits.

Size, geographical scale, and frequency of introduction are among the factors that are important in determining whether a particular introduction will become established or spread. Therefore, small-scale field testing involves different considerations than does large-scale (e.g. commercial) application. This is not to suggest that small-scale testing should be exempt from examination for regulation, but simply that any risks are likely to be much smaller and more easily managed than those for large-scale applications. Nor does this suggest that all large-scale applications will be problematical, since we have many examples to the contrary, including vaccines, biological control methods, and the use of rhizobia in agriculture.

One must bear in mind that the greatest impact on the biosphere is through human activity. For example, deforestation, the widespread use of antibiotics, vaccines, herbicides, and pesticides, or the widespread introduction of a single type of organism in agriculture has led to a loss of genetic diversity. Such loss has had dramatic and unfortunate consequences for human survival because it has led to environmental degradation, loss of stability, and a depletion of biological resources that are valuable for food, fibre, medicines, and other purposes.

As the ability to manipulate our environment increases, so much an awareness of these problems and of the need to exercise our power wisely.

Risk assessment

As already discussed, the risks of making a specific introduction must be weighed against the perceived benefits and the risks of not making the introduction. This balancing is part of risk management. This section addresses only the assessment of risks of introduction, but it is important that it be integrated into the management framework.

The properties of the introduced organism and its target environment are the key features in the assessment of risk. Such factors as the demographic characterization of the introduced organisms; genetic stability, including the potential for horizontal transfer or outcrossing with weedy species; and the fit of the species to the physical and biological environment. The scale and frequency of the introductions are important related factors. These considerations apply equally to both modified or unmodified organisms, and, in the case of modified organisms, they apply independently of the techniques used to achieve modification; that is it is the organism itself, and not how it was constructed, that is important.

Each proposed introduction must be treated on its own merits, but this does not suggest that each needs to be considered *de novo*. As experience accumulates with particular kinds of introduction in particular environments, more generic approaches to these classes of introductions can be developed. The bases for classification should be refined continually, providing a set of criteria that will allow any proposed introductions judged to be innocuous to be carried out speedily and those judged to be problematical to be given the attention they deserve.

It is important to note that generalizations developed for particular groups of organisms (e.g. microorganisms) cannot be extended automatically to other groups (e.g. plants), which may have very different genetic and demographic characteristics, dispersal and reproductive mechanisms, and trophic positions.

In the development of assessment procedures, the potential for containment, monitoring, and mitigation must receive consideration. In this regard, it should be generally assumed that the likelihood of being able to recall introduced organisms that have escaped containment is very small.

Coda

The new genetic methodologies add additional tools to the spectrum of techniques available to improve the human condition. These will lead to rapid improvements in the development of ecologically sound approaches to agriculture and to environment management, and in the acquisition of a better understanding of biological systems. These

benefits in their various forms should be available to everyone, and know no national boundaries. It is therefore essential that the broadest possible international cooperation and datasharing be supported by all countries. Each improvement in our capacity to modify the environment carries with it responsibilities to use that capacity wisely, with special attention given to the importance of maintaining biological diversity.

SCOPE Report 44: Introduction of genetically modified organisms into the environment is edited by Harold A. Mooney and Giorgio Bernardi and published by John Wiley & Sons, Chichester, UK, 1990. xx + 201 pp. ISBN 0 471 92677 9. Price GBP £45.00.

Polymer blends and networks

Volume 38 of *Makromol. Chem. Macromol. Symp.* (September 1990) contains papers presented as invited lectures at the IUPAC-sponsored 32nd Microsymposium on Macromolecules — Polymer Blends. This meeting was held in Prague, Czechoslovakia, 17–20 July 1989.

The volume includes a paper by Walter Heitz and Hans-Werner Schmidt (Marburg, Germany) on 'Soluble LC polyesters and their blend behaviour.' Heitz is President of the IUPAC Macromolecular Division, and an IUPAC affiliate. IUPAC affiliate P. Munk (University of Texas at Austin, USA) presented a paper on 'Thermodynamics of miscible polymer blends studied by inverse gas chromatography.' Another affiliate, L. H. Sperling (Lehigh University, Bethlehem, USA) presented a paper on 'Interpenetrating polymer networks, the state of the art.'

Volume 40 (December 1990) is devoted to the IUPAC-sponsored Networks 90: the 10th International Symposium on Polymer Networks and the 10th Polymer Networks Group Meeting. These meetings were held in Jerusalem, Israel, on 20–25

May 1990. The volume, which contains 20 papers, is dedicated to Prof. Karel Dušek (Institute of Macromolecular Chemistry of the Czechoslovak Academy of Sciences in Prague) on the occasion of his 60th birthday in recognition of his contributions to polymer science. Dušek is one of the founders of the Polymer Networks Group.

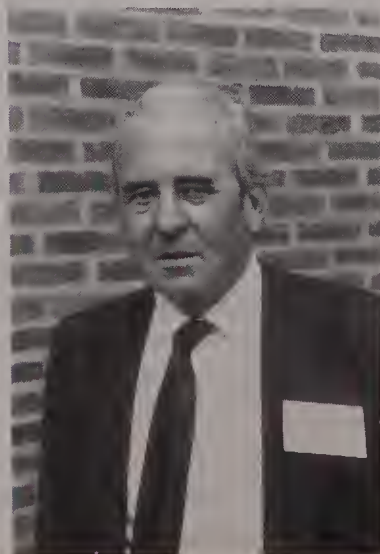
International Newsletter on Chemical Education

The December 1990 issue of *International Newsletter on Chemical Education* (No. 34) contains reports from Stanley Langer on a regional workshop on 'Chemistry teaching in industry in developing countries' held in Nepal, from Hans-Jürgen Schmidt on an International Council of Associations of Science Education (ICASE) symposium in Dortmund, Germany, and from Brian Newbold on a survey of the place of the history of chemistry in university chemistry courses.

Then Michael Hall outlines the activities of CATALYSIS, which is the only UK museum of chemical industry. The first phase of the museum was opened in 1989. Tongwen Hua and Zufu Chen describe the chemical education scene in the People's Republic of China, while Gerogi Ivanov highlights the development of the talents, capabilities and creativity of pupils through the Pupils' Research Laboratory in Bulgaria.

Alex Johnstone and Kirsty Letton bring their research skills to bear on the question 'Why do practical work?' with some provocative thoughts, and Martin Smith and Terry Whitehead describe a video package of demonstrations developed at the University of Leeds, UK.

The International Newsletter on Chemical Education is published by the IUPAC Committee on the Teaching of Chemistry in cooperation with Unesco. The Editor is Peter Towse, University of Leeds, LS2 9JT, UK.



The 32nd Microsymposium of Macromolecules Polymer Blends was held in Prague. One of the lecturers was IUPAC Division President (and affiliate) Walter Heitz.

Contributions to the development of chemistry in Peru

Dr Angela Danil de Namor

Organizing science to benefit the Third World was one of two key themes of the International Conference on 'Chemistry and Developing Countries' held in London in April 1991 (see September 1991 issue of *CI*). The theme concentrated on the mechanisms and strategies for organizing science (with particular reference to chemistry) to benefit developing countries and covered training, resources and the role of national bodies and governments. The following is an edited version of a lecture by Dr Angela Danil de Namor presented at the conference. The lecture was entitled 'Contributions to the Development of Chemistry in South America: The Link Between the Universities of Surrey (UK) and San Agustin (Peru)'.



Dr Angela Danil de Namor (IUPAC Commission on Solubility Data) is Assistant Dean of Academic Links with Latin American Universities and Chairman of the Local Organizing Committee of the forthcoming

IUPAC-sponsored International Symposium on Macrocyclic Ligands for the Design of New Materials.

Introduction

Participation of Latin American scientists at international chemistry meetings is minimal especially as scientists from developed countries are more inclined to collaborate with universities with established infrastructures. As far as Latin America is concerned, little effort has been made to rectify this situation.

In view of this, the British Council in Peru has a policy of encouraging the development of universities outside the capital city. Thus, in 1983, I visited the National University of San Agustin, Arequipa, Peru. The main reason for my visit was that the Chemistry Department at the university makes a significant contribution not only to the Arequipa community but also to the southern region of Peru. The department produces a considerable number of graduates each year of which 50% go straight into industry, 35% into teaching and the rest into a wide range of professional jobs.

Considering that the south of Peru is an important region of industrial activity, it was important to improve the academic standard of chemistry

graduates — particularly by raising the standards of teaching. During my first visit to the university, I came to the conclusion that the best way to improve standards was to establish an MSc Programme in Chemistry. The overall aim of the programme would be to update and upgrade members of staff of the Chemistry Department as well as staff from other universities and industry in Peru.

MSc Programme in Chemistry

The MSc Programme in Chemistry was the first postgraduate course in any subject in the south of Peru. The establishment of the course therefore needed the approval of the National Council of Rectors of Peruvian Universities. The objectives of the programme were:

- to provide a better understanding of the different branches of chemistry;
- to familiarize students with the reading, understanding, and critical evaluation of a scientific piece of work;
- to encourage awareness of the function of the chemical industry and its relationship with the national economy;
- to encourage initiatives to undertake research with the originality and standards required to compete at an international level.

Organization. All academic matters relating to the MSc Programme and the link between the university and the University of Surrey were the responsibility of the Academic Director. The Local Committee, consisting of members of staff from the University of San Agustin, advised the Academic Director on legal and administrative matters relating to the university.

Teaching staff involved were: Dr R. Hayward, the late Dr R. E. Marks, Prof. K. B. Nolan, Prof. R. Walker, Prof. R. Tailby and Dr J. A. Lamb (University of Surrey, UK); Dr E. Bishop and the late Dr G. Pratt (University of Sussex, UK); Dr B. G. Cox (University



Left: Prof. Russel Tailby (Chemical Engineering Dept, University of Surrey) lectured on industrial chemistry in the San Agustin MSc programme. Right: Prof. Cohen-Adad (University Claude Bernard) is a member of the Latin American-European Research Group.

of Stirling, UK); Prof. I. Wasö (University of Lund, Sweden) and Dr M. Saxby (Leatherhead Food Research Association, UK). Prof. Wadsö was also the external examiner appointed by the Universities of Surrey and San Agustin.

Sponsors of the programme were the (British) Overseas Development Administration (ODA); the British Council; the Peruvian National Research Council and the University of San Agustin.

Entry requirements. Admission to the MSc Programme in Chemistry was granted on the basis of the applicant's academic record, an interview and a written examination on basic concepts in the three branches of chemistry (organic, inorganic and physical). The purpose of the written examination was not only to assess the general standard of the candidates but also to establish at which level the postgraduate courses should begin.

Postgraduate courses. Lecture courses took place in March/April and August/September. These periods were selected to suit European academics who were more likely to be free of teaching commitments.

Most of the courses in the first year of the MSc programme were designed in such a way as to provide students with a sound knowledge in the three branches of chemistry. Some of the courses in the first year and most in the second year are related to applied topics of major importance:

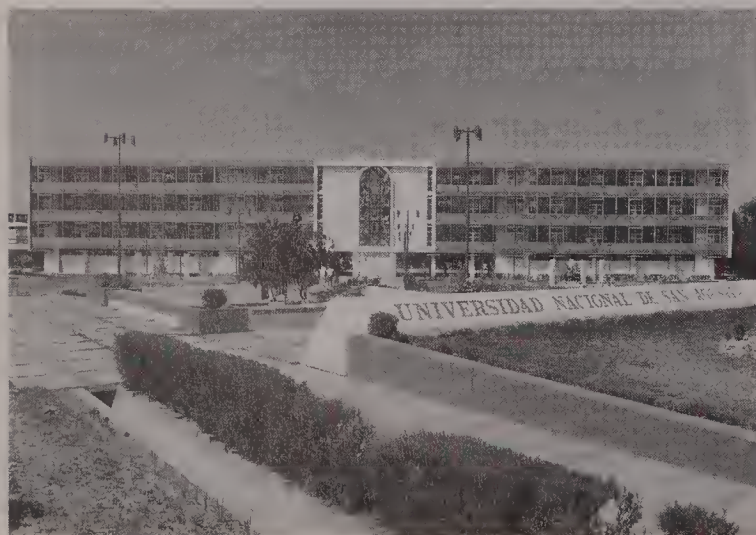
- industrial applications of organometallic compounds;
- thermodynamic and kinetic aspects related to metal-extraction processes — most relevant to a mining country such as Peru;
- techniques used for structure determination — an aspect relevant for the chemical study of natural products in Peru;
- food as natural products: involving nutritional, medical and chemical aspects of food composition and transformations that occur during processing. Food analysis and good practices in the food laboratory.

Besides these, the Industry Chemistry I and II courses are a unique feature of the programme. The aims of these two courses are to make students aware of the function of the chemical industry and its links with the national economy. Thus, the Industrial Chemistry I course covers the following topics:

- impact of the economic environment on the operation and activities of chemical industry;
- chemical processes — detailed accounts and the modern approach;
- applications of basic concepts in chemistry to chemical processes.

The Industrial Chemistry II course concerns all factors (technical, economic, legal, safety) involved in the design of a chemical plant.

Teaching methods. Teaching methods used were: lectures; practicals associated with the lecture courses in inorganic, organic and physical



Linked: National University of San Agustin (left) and University of Surrey (above).

chemistry or critical evaluation of scientific papers relevant to the specific subject; tutorials; and course work.

Assessments. All assessments, which included examination papers, written reports on practicals, critical evaluations and course work, were done at the University of Surrey in collaboration with academics from other institutions involved in the teaching of this programme. All examinations were translated by myself into Spanish so the students have their scripts in English and in Spanish.

Research projects. Research projects are part of the requirements for the award of the MSc degree of the University of San Agustin. This is by far the most difficult task to fulfil in the entire MSc programme.

There are several reasons for this. The main one is the present lack of human resources in Arequipa with the appropriate research experience to design and supervise research projects. With a few exceptions, most of the research projects were supervised by myself. Other reasons are the lack of bibliographic material, equipment, chemicals and other facilities. These difficulties are of a more serious nature in federal universities than in universities in the capital.

In this context, the University of San Agustin is not an exception. I managed to obtain the approval of the Rector of the University to assign one of the laboratories of the Chemistry Department for the exclusive use of MSc students. However, there is a continuous struggle to develop the laboratory due to the financial difficulties facing Peruvian universities.

Some of the experimental work carried out by the first group of MSc students as part of their research projects was done in industry or with help provided by other universities in Peru at my request. Funds for six of the 12 research projects in the first intake of MSc students were provided by the Peruvian National Research Council (CONCYTEC). The Council also gave scholarships to the 29 students enrolled in the second intake.

In order to achieve this, I was heavily involved in helping students to write their research proposals. As a result, we achieved a 100% success rate in grant applications. This is an indication of the high reputation the programme has gained in Peru.

Furthermore, a grant application submitted to CONCYTEC requesting funds for the purchase of some of the accessories required to build a solution calorimeter was successful. Additional parts of the equipment were kindly donated by Prof. I. Wadsö who agreed to build the calorimeter. This equipment is now installed in the MSc laboratory and has been extensively used by students carrying out research projects on extraction processes.



San Agustin MSc graduates 1987.

Results. In 1987, the number of MSc graduates was 12. In 1990 the number was 29 making 41 in all. Of these 68% found employment in academic posts, 10% in pharmacy, 10% in industry, 7% in technical jobs and 5% in business.

Future of the course. There is no doubt that the University of San Agustin is now in a position to run most of its postgraduate courses in chemistry. The Chemistry Department now has 16 MSc graduates from which eight of the most able would be able to teach on the MSc postgraduate courses. The remaining eight could make a valuable contribution to undergraduate teaching.

Those MSc graduates of 1987 who were given responsibility for teaching postgraduate courses for the second intake did an excellent job judging by the examination results assessed at the University of Surrey and other institutions involved.

The responsibility for the continuation and growth of the MSc programme should now be transferred to San Agustin, but some kind of contact between San Agustin and Surrey should be maintained in order to ensure its continued success. I have now accepted the invitation of the University of San Agustin to continue with the direction of this programme. The entry examination for the third intake of MSc students took place in August 1991.

Research developments in Peru

The training of a number of MSc graduates in research relevant to the needs of the country is a logical extension of the MSc programme. Following various discussions in Peru, I came to the conclusion that it was necessary to create a research centre on one particular area of research.

Because the main source of income for Peru derives from the mining industry, we concluded that metal extraction was a suitable area for such research. Accordingly, with the support of the Peruvian Government and the copper-mining industry (Cerro Verde) and in collaboration with ICI (Dr Brian G. Cox) and the Department of Chemistry of the Royal College of Surgeons (Prof. Kevin B. Nolan) in the UK, I submitted a research proposal on



Mining provides the main source of income for Peru.

the 'Selective extraction of copper by new complexing agents' to the Commission of the European Communities. This resulted in the award of a grant as part of an agreement between the Community and the Peruvian Government. The grant has enabled a number of MSc graduates from Peru to carry out research on copper extraction at the Thermochemistry Laboratory at Surrey.

Research on selective extraction of copper. Solvent extraction technology has been successfully applied to the recovery and purification of metals. However, as the world-wide concern in reducing existing limits of chemical pollutants in the environment increases, extraction processes requiring the use of considerable amounts of organic solvents are likely to be replaced by processes using new environmentally safer materials such as recyclable polymers containing ion-selective ligands as anchor groups.

Undoubtedly, the discovery in the last two decades of synthetic macrocyclic ligands has opened the way for the development of a large variety of new materials for extraction purposes. Methods used in Peru are based on the selectivity of oximes for copper. However, these oximes are known to be selective for aluminium(III), iron(II) and iron(III), all of which are found with copper(II) in ores. Therefore, the main aim of this project are:

- to formulate the basis of the selection of macrocyclic ligands to be used as anchor groups in polymers from distribution data in solvent systems containing the monomer in the non-aqueous phase and Cu(II), Al(III), Fe(II) and Fe(III) in the aqueous phase;
- to develop new polymeric materials containing copper-selective ligands as anchor groups.

This project illustrates how highly academic research can be linked to areas of world-wide priority (new materials, macrocyclic chemistry and environment) and it is one in the series of research programmes to be developed in the next five years in collaboration with Latin American and European institutions.

The European-Latin American Research Group on Macrocyclic Ligands for the Design of New Materials.

I feel strongly that if European research is to stretch beyond the limits of Europe, then European scientists should start planning new strategies to contribute to the development of research in developing countries. Such a task requires the establishment of multidisciplinary research groups in Europe. I have built a network of contacts with universities in Latin America and in Europe and such multidisciplinary groups have now been launched.

The following European scientists and their institutions have all been involved in this project:

- Dr F. Arnaud Neu (EHICS, Strasbourg, France);
 Prof. A. Braibanti (University of Parma, Italy);
 Prof. R. Buoaziz (University of Rouen, France);
 Profs. M. I. and R. Cohen Adad (University Claude Barnard, France);
 Dr B. G. Cox (ICI, UK);
 Dr A. F. Danil de Namor — Chairman (University of Surrey, UK);
 Prof. A. McKervey (The Queen's University, Belfast, UK);
 Prof. K. B. Nolan (Royal College of Surgeons, Dublin, Ireland);
 Prof. L. Nuñez Regueira (University of Santiago, Spain);
 Prof. E. Pelizetti (University of Torino, Italy);
 Prof. M. J. Schwing-Weill (EHICS, Strasbourg, France);
 Prof. R. Triolo (University of Palermo, Italy);
 Prof. I. Wadsö (University of Lund, Sweden).

An IUPAC-sponsored International Symposium on Macrocyclic Ligands for the Design of New Materials organized by the Latin American-European Research Group will take place at the University of Surrey on 14–15 September 1992. The symposium aims to promote research in Latin America in three priority areas: new materials; macrocyclic chemistry and the environment.

Acknowledgments

Special thanks are due to Dr G. Haigh, Academic Registrar of the University of Surrey and to all my colleagues who collaborated in this project. The sponsorship of ODA, the British Council, the European Economic Community and CONCYTEC is gratefully acknowledged. Particular thanks are due to the IUPAC Secretariat at Oxford which, at my request, has given most of the MSc graduates the opportunity to enter the IUPAC affiliate membership programme.

Names and Addresses of Officers of IUPAC Bodies 1991–1993

Subject to approval by National Adhering Organizations

Where telephone and telefacsimile (fax) numbers are quoted, the country code, area code in brackets, and subscriber's number are prefixed by a plus sign and this should be substituted by a member's own international country code, which varies from country to country.

So that the female members of the Union can be easily identified, their forenames are printed.

Some special Commissions have been formed to undertake tasks within a specific time limit, and the abbreviation LLTC (Limited Life Time Commission with duration of only four years) has been included in the name of these Commissions.

If officers who have not already provided the Secretariat with their telephone telex and fax numbers would kindly do so, the records in Oxford can be completed. *Also, will officers please advise the Secretariat of any changes which are necessary, and any errors that need correcting.*

The information printed for each person listed is held in the membership databases at the IUPAC Secretariat in Oxford.

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Prof. G. Modena
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Prof. K. I. Zamaraev

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VII.4 TOXICOLOGY

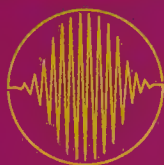
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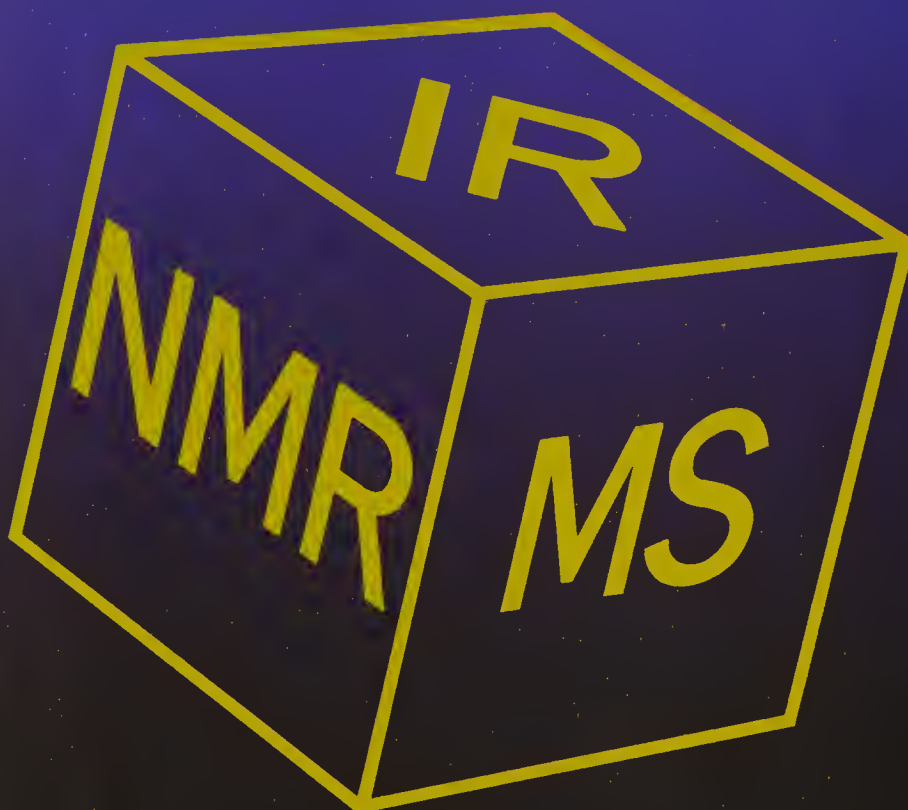
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Computerized spectroscopy databases

Stephen R. Heller

This is the fourth in a series of articles aiming to promote a higher awareness of the computer applications in the management, dissemination, and uses of chemical data. It describes a number of computerized spectroscopy databases.



Dr Stephen Heller is Chairman of the IUPAC Committee on Chemical Databases (CCDB). His address is: USDA, ARS, BARC-W, Building 005, Plant Genome Research Program, Beltsville, MD 20705-2350, USA.

Introduction

This article is part of the efforts of the IUPAC Committee on Chemical Databases (CCDB) to familiarize the IUPAC membership on various aspects of computer activities in chemistry. Previous articles have described online databases¹ the Beilstein and Gmelin databases² and chemical structure searching.³ This article will concentrate on the following spectroscopy databases:

- Mass Spectrometry;
- Infra-red;
- Raman;
- ¹H NMR;
- ¹¹B NMR;
- ¹³C NMR;
- ¹⁵N NMR;
- ¹⁷O NMR;
- ¹⁹F NMR;
- ³¹P NMR;
- ESR.

Crystallographic databases will not be covered here for reasons of space limitations. For further details about these databases [Powder Diffraction, NIST (National Institute of Standards and Technology, Gaithersburg, USA), Single Crystal Data, Organic X-ray Crystal Data, and the Inorganic X-ray Crystal Data] please refer to the sources and related information.⁴⁻⁸

Computer-based spectral databases are both some of the oldest and most widely used computerized products in chemistry. This article

gives an overview of the field, as well as highlights some of the more interesting activities and sources of spectral data. For more comprehensive articles on this subject the reader is referred elsewhere.^{9,10} This article covers only computer-readable databases which are available on magnetic tape, floppy disks, or on CD-ROM. No mention is made of the many spectral collections available in printed form.

The reason for the long-term and widespread use of computerized spectral databases stems from their practical value in analytical and organic chemistry laboratories, as well as from the ease in which these data could be made available, retrievable, and searchable. Whilst the value of such databases seems clear, the need has not been met to the satisfaction of many.¹¹⁻¹³

Isenhour¹² wrote of the frustration that he and his colleagues have with the lack of large, representative, high-quality spectral databases that would enable further research in search and interpretation studies. Furthermore, Shelly¹³ has written 'Although many spectral databases have been created, few are of high quality and many are useless.' The reason for this are the errors in the databases, incomplete data, and lack of structural information associated with a spectrum, all of which inhibit further useful work in the areas of concern to Isenhour. As we will see later in the paper, there has been some progress in the 5 years since these comments were made. As these databases have continued to develop the emphasis has moved from quantity of data to the quality of the data, the largest collections are not necessarily the best, nor the most widely used. This point will be further discussed later in this article.

Infra-red data

Infra-red data are the oldest type of spectral data which have been available to the chemical community. The original printed collections of data such as from Sadtler, were from prism and grating instruments, which have lower resolution than the modern FT-IR instruments. As Lias has noted,⁹ many spectroscopists believe that such older data are not adequate for good reference databases.

An example of the new generation of IR data is the Aldrich-Nicolet Digital FT-IR database of condensed-phase (liquid) spectra and the

condensed-phase Sigma-Aldrich Biochemical Library. Both contain about 12 000 spectra each. In addition there is a vapour-phase Aldrich FT-IR database of 5000 spectra. There is also a collection of about 61 000 condensed-phase spectra available from Sadtler. Sadtler also sells a vapour-phase library of some 5000 spectra. There is a smaller collection of 3000 FT-IR spectra which EPA commissioned in the 1980s for environmental analysis studies.

More recently NIST has been undertaking experimental work in order to expand this collection and provide good reference data. NCLI (National Chemical Laboratory for Industry in Tsukuba, Japan)¹⁴ has a database of about 26 000 unique IR spectra, which grows to 60 000 spectra when multiple spectra of the same chemical are included. Chemical Concepts also has a database of some 28 000 IR spectra obtained from BASF. These are full, FT-IR spectra, with connection tables.

Raman

The NCLI¹⁴ has a database of about 3600 Raman spectra, without connection tables.

Mass spectrometry

Mass-spectral data, primarily owing to their importance in environmental analysis, have become the most widely used tools for chemical-substance identification. The regulatory power of the US EPA (Environmental Protection Agency) has been the driving force behind this activity and the development of what now is the called the NIST/EPA/MSDC mass spectral database.¹⁵ As there has been a recent discussion¹⁶ regarding the matter of mass-spectral data quality it is instructive to comment here about this issue. Over the past three decades a number of mass-spectral databases have been developed in Germany, Japan, UK and USA. At present the two largest of these have evolved with very different philosophies in how they are being built. A third database and associated search software of about 30 000 high-quality mass spectra from a number of Max-Planck Institutes in Germany, as well as from universities, is also available from Chemical Concepts.¹⁷

The John Wiley collection¹⁸ attempts to collect any available spectra with no published acceptance criteria. This database lacks the structural information which Shelley has commented on¹³ and does not contain any connection tables. Thus, one often (some 17 000 out of almost 140 000 spectra) finds only two to five peaks in a spectrum. To compensate for the lack of data the developer of the Wiley database computer-generates isotopic abundance peaks.

On the other hand the NIST collection of some 54 000 spectra, virtually all of which have

connection tables, consists primarily of reference spectra for chemical analysis, many of which have been obtained by the US Government by running the mass spectra in the laboratory, thus ensuring both high-quality as well as complete spectra. The importance of this point is highlighted by the fact that of the spectra unique to the Wiley database almost 42% (some 58 000 spectra) have less than 10 peaks, whereas this is true in 3.5% of the NIST spectra.¹⁶ The NIST scientists also found that a spectrum unique to the NIST database contains nearly five times the number of peaks as a spectrum unique to the Wiley database. In addition to the data quality study by NIST, the Max Planck Institute of Mulheim, Germany is conducting its own data quality analysis of mass-spectral databases and it has also found similar results.

In summary, the issue of data quality is one that is not easily discovered and potential users of these spectral databases should carefully examine the content and description as part of their consideration of which database to obtain which will meet their needs.

NMR databases

While there are publicly available spectral databases of seven different nuclei (primarily ¹H NMR, ¹¹B NMR, ¹³C NMR, ¹⁵N NMR, ¹⁷O NMR, ¹⁹F NMR, and ³¹P NMR), the discussions here will focus on the ¹³C NMR databases, as these data are presently regarded as the most useful.

¹³C NMR. The premier collection of over 100 000 ¹³C NMR data is the so-called Bremser database, named after the original developer at BASF.¹⁹ This database has been developed at BASF over the past two decades and has been evaluated and checked carefully by the BASF scientists. The database also contains chemical structures and chemical shifts have been given assignment. Recently the CAS Registry Number has been added to the database



The Institute of Organic Chemistry, Novosibirsk, USSR, has one of the four major collections of computer-based ¹H NMR data.

entries which has further enhanced its value and usefulness. There is also a database of about 30 000 spectra and corresponding connection tables available from Sadtler.²⁰

Recently the German Government has decided to sponsor a company, Chemical Concepts,¹⁷ to take the Bremser BASF database, together with spectral data from a wide variety of other sources, and associated search and analysis software and make the entire compilation available to the chemical community. This database, which continues to grow at a substantial rate, now contains about 100 000 spectra, all of which have connection tables in which each carbon atom is assigned a particular chemical shift.

¹H NMR. There are four major collections of computer-based ¹H or proton NMR data, obtained mostly at a frequency of 60 or 90 MHz. These are Chemical Concepts (about 13 000 spectra), Sasaki/Japan (10 000 coded spectra and 4000 digitized full spectra),²¹ NCLI (about 6500 spectra),¹⁴ and the Institute of Organic Chemistry, Novosibirsk, USSR (about 50 000 spectra).²²

¹¹B NMR. Chemical Concepts¹⁷ distributes a database of about 9000 spectra of ¹¹B NMR data.

¹⁵N NMR. Chemical Concepts¹⁷ distributes a database of about 1000 spectra of ¹⁵N NMR data.

¹⁷O NMR. Chemical Concepts¹⁷ distributes a database of about 900 ¹⁷O NMR data.

¹⁹F NMR. Fraser-Williams²³ distributes a PC-searchable database of about 10 000 spectra of ¹⁹F NMR data. The database is data and text searchable. There is also a ¹⁹F NMR database of about 2000 spectra available from Chemical Concepts.¹⁷

³¹P NMR. Chemical Concepts¹⁷ distributes a small database of about 2200 spectra of ³¹P NMR data.

ESR

NCLI¹⁴ has created a database of about 1300 ESR spectra. It has not yet been made publicly available.

Integrated systems

The BASF system, parts of which have been described earlier in this article, is the one which Chemical Concepts has been refining and improving. It is called SpecInfo. The unique features of SpecInfo, as opposed to most other single spectral database systems is the integration of their software for a total solution to a problem using spectral identity and similarity, spectral interpretation, spectral simulation, spectral calculations, and structure determination. This is best illustrated in Fig. 1, which shows how data from a number of different spectroscopies can be integrated into a solution of a typical laboratory problem. Figure 2 shows the status of SpecInfo spectral databases.

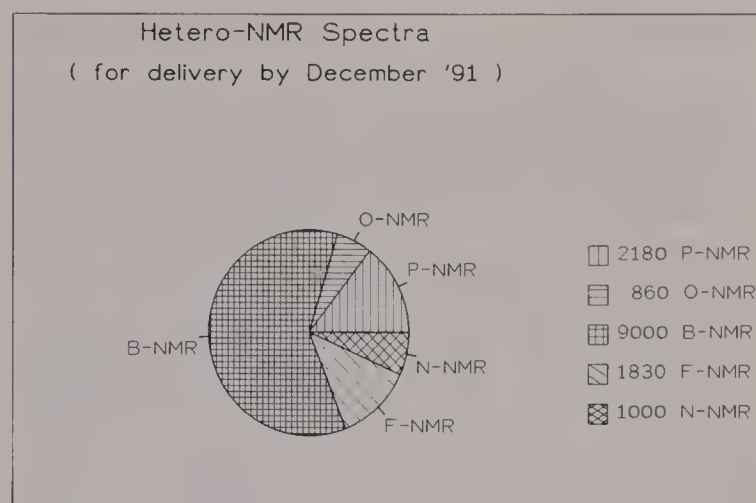


Figure 1.

There are two important features of SpecInfo which should be noted here. The first is the ability to add your own spectra to the database so that an individual or laboratory can make use of the powerful and various software analysis programs in SpecInfo. The second is the policy of the Chemical Concepts to work with universities in providing them with a no-cost copy of the system in return for spectral contributions.

Summary

In summary this article has described a number of computer-readable databases in the area of spectroscopy, as well as one integrated spectral system. The size and quality of these databases varies considerably, as does their cost. As one considers the need to use any of these databases, the problems which need to be solved should be well understood so that the choice of which database to obtain will indeed provide you with the proper solution to your problem.

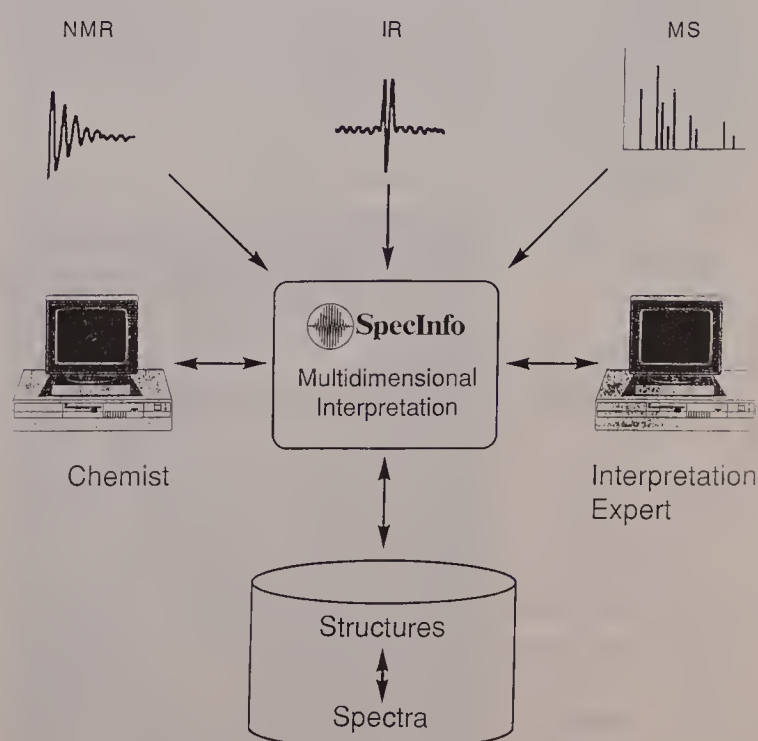


Figure 2. Status of SpecInfo spectral databases.

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23. Fraser-Williams Ltd, London House, London Road South, Poynton, Cheshire SK2 1NJ, UK.

PAC Reviews

Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Glycosylation reactions

Recent advances in glycosylation reactions' was the topic of a lecture by Pierre Sinaÿ (Ecole Normale Supérieure, Paris, France) presented at the 15th International Carbohydrate Symposium held in Yokohama, Japan, on 12-17 August 1990.

In his lecture, Sinaÿ, presented several novel solutions to the efficient and selective preparation of glycosides. Commercial tris(4-bromophenyl) ammoniumyl hexachloroantimonate, a one-electron transfer homogeneous reagent, nicely activates in acetonitrile various ethyl or phenyl *S*-glycosides in good yield. In a variation on the theme, phenyl *S*-glycosides react with alcohols under mild electrochemical conditions to give the corresponding *O*-glycosides.

Azidoxanthates, prepared via a two-step sequence from various galactals are efficient galactosyl donors for the stereoselective synthesis of protected precursors of biologically important galactosamine-containing oligosaccharides. Sinaÿ has also discovered that anomeric enol-ethers, or the corresponding carbonates, are remarkably efficient glycosyl donors. Finally, a 'non-orthodox' strategy based on the idocyclization of appropriate acyclic enol-ethers resulted in a novel approach to KDO-containing disaccharides. This latest synthesis critically benefitted from the use of the Tebbe reagent for the preparation of the key starting enol ethers.

Sinaÿ's lecture and other plenary lectures delivered at the Yokohama symposium were published in the April 1991 issue of *PAC*. They included a lecture on 'Xylose-containing carbohydrate chains derived from *N*-glycoproteins' by 1990 Whistler Award winner Johannes Kamerling (Utrecht University, The Netherlands) — see *CI* Vol. 12, No. 4, pp. 128-9, 1990.

Kamerling reviewed the state of the art on this topic with respect to structural analysis, organic synthesis, conformation analysis, biosynthesis, lectin binding, an immunology. He pointed out that xylose-containing *N*-linked carbohydrate chains are integral parts of certain plant and animal glycoproteins. In all of the known structures, β -D-xylose is 1–2 linked to β -D-mannose of the trimannosyl-*N,N'*-diacetylchitobiose unit. If α -L-fucose is present at the asparagine-linked *N*-acetyl-D-glucosamine, then there are differences in the sites of its attachment, namely, α 1–3- or α 1–6- linked, depending on the biological origin. The α -D-mannose residues can be substituted with additional monosaccharides or 3-*O*-methylated.

Winifred Watkins (MRC Clinical Research Centre, Harrow, UK) lectured on 'Chemical structure, biosynthesis and genetic regulation of carbohydrate antigens.' She explained that the carbohydrate antigens associated with the human ABO and Lewis blood group systems are prime examples of allogenic diversity. Elucidation of their structures, pathways of biosynthesis and genetic regulation has provided a model for understanding the genetic and enzymic basis of changes in expression of cell surface carbohydrates that occur in normal differentiation and malignancy.

Osmiumammines

Six plenary lectures presented at the 28th International Conference on Coordination Chemistry were published in the May 1991 issue of *PAC*. The conference was held in Gera, Germany, on 13–18 August 1990.

The lectures included on 'Aspects of h^9 binding by osmiumammines' presented by 1983 winner of the Nobel Prize in Chemistry Henry Taube (Stanford University, USA). Taube said that traditional coordination complexes such as the metalammines have not figured prominently in the field of organometallic chemistry. It therefore comes as something of a surprise that the organometallic chemistry of osmiumammines is proving to be very rich.

The powerful tendency of osmium(II), when the auxiliary ligands of saturated, for back-bonding interactions account in large part for the stability of a large number of the new organometallic species based on this metal center, which have been prepared. In most cases, the one-electron oxidation of the osmium(II) complexes take place at potentials of less than 1V, and the resultant species have enough kinetic stability for the organometallic product to be characterizable. Because of the different requirements of osmium(II), with its tendency for electron donation to π acids, and osmium(II), which acts mainly as a σ acceptor, the oxidation is often accompanied by dramatic changes.

Taube dealt with a number of specific topics including: the interaction of osmium(II) with aromatic molecules, and the attending activation for hydrogenation; linkage isomerization accompanying oxidation; and characterization of alkyne, allyl and dihydrogen complexes. He pointed out that weary work has been done with the pentammine moiety. Many new effects are being revealed in the studies with the cis-tetraammine complexes, now underway. He touched on the highlights of this work.



Henry Taube.
(Photo courtesy
The Nobel
Foundation)

Heinrich Vahrenkamp (Universität Freiburg, Germany) presented a paper on 'Ligand sphere reactivity of organometallic clusters'. He said that designed synthesis of clusters with face bridging functional organic ligands have paved the way for reactivity studies. Simple multiply bonded substrates of the C=C, C=N, N=N type have been attached to three metal atoms in bonding modes isoelectronic to the μ_3 -alkyne, the μ_3 -vinylidene and the μ_3 -alkylidyne fashion. The interconversions of the bonding modes and the cleavage of the multiple bonds have been investigated. Starting from the simple substrates the combination of organic fragments can form new organic molecules. The interconversions of phosphorus ylides in the ligand sphere of clusters shed some light on possible pathways between carbon atoms, CO and CH₂ groups on metal surfaces. Likewise, intermediates which are highly reactive in mononuclear comple-

xes can be trapped as stable derivatives of clusters.

The other plenary lectures published in the May issue of *PAC* were:

- Developing the reactivity of multiple bonds between metal atoms: inorganic functional groups (Malcolm H. Chisholm, Indiana University, USA)
- ESCA (Electron spectroscopy for chemical analysis) investigations of coordination compounds (Vadim Nefedov, Institute of General and Inorganic Chemistry, Moscow, USSR);
- Mechanisms of double and single carbonylation reactions catalyzed by palladium complexes (Akio Yamamoto *et al.*, Tokyo Institute of Technology, Yokohama, Japan);
- Coordination at solid surfaces; investigations on the atomic scale by field ion microscopic techniques (Jochen H. Block, Fritz-Haber-Institut de Max-Planck-Gesellschaft, Germany).

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *CI* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of national/regional centres appeared in *CI*, Vol. 11, No. 2, p. 67, 1989.

Nomenclature for chromatography

The Commission on Analytical Nomenclature of IUPAC has been active for a long time in establishing nomenclature for chromatography. After proposing suitable nomenclatures for gas chromatography and ion exchange the Commission developed a unified nomenclature for chromatography. Parallel to these activities other standardization bodies and scientists have also dealt with nomenclatures on gas chromatography, liquid chromatography, exclusion chromatography and planar chromatography.

The original activities of the IUPAC Commission

on Analytical Nomenclature aimed to create a unified nomenclature applicable to all forms of chromatography took place over 10 years ago. Since that time the chromatographic techniques advanced significantly. Based on these developments it was decided to prepare a new, up-to-date universal chromatography nomenclature, which also considers the recommendations incorporated in the various other nomenclatures developed since the original work of IUPAC.

The present nomenclature was prepared for the Commission by Dr L. S. Ettre. It considers all the previous nomenclatures referenced above as well as the three publications dealing with these nomenclatures.

The present nomenclature deals with all chromatographic terms and definitions used in the major chromatographic techniques such as gas, liquid and supercritical-fluid chromatography, column and planar chromatography, partition, adsorption, ion-exchange and exclusion chromatography. However, it does not include terms related to the results calculated from chromatography data, such as the various molecular-weight terms computed from the primary data obtained by exclusion chromatography.

Comments on the document are welcome and should be sent by 30 June 1992 to: Prof. C. A. Cramers, Eindhoven University of Technology, Lab. Instrumental Analysis, Dept. of Chemistry, 5600 MB Eindhoven, The Netherlands.

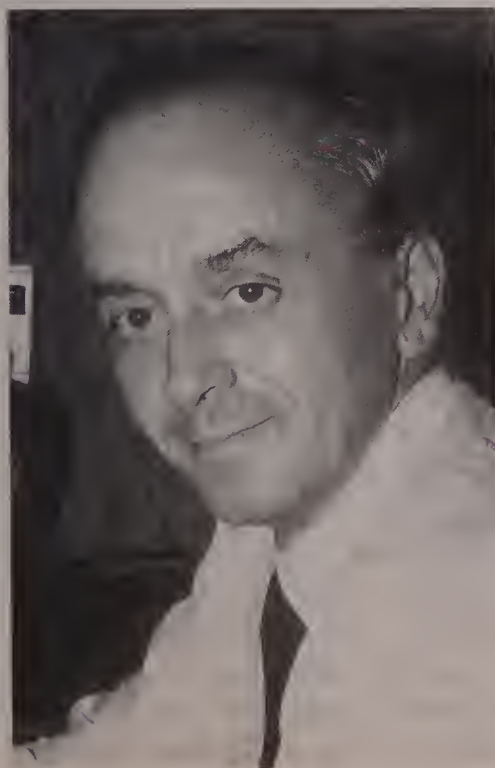
Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Some aspects of the analysis of residues of dicarboximide fungicides in food

The commercially important members of the dicarboximide fungicide group — iprodione, procymidone and vinclozolin — are considered in this report. The metabolism in plants, the residue levels in field treated crops, and the analytical methods for determining the residues of these compounds are summarized. The data indicate that the residues of parent compounds are present in food at such concentrations which enable their determination with several multiresidue procedures. Since the total residues deriving from approved, registered use of the compounds are toxicologically acceptable, the MRLs (maximum residue limits) should be expressed and the residues analysed as the parent compounds alone to simplify the analysis of a great number of samples in the regulatory laboratories.

This report is No. 28 in the series of IUPAC Reports on Pesticides. It was prepared for publication by A. Ambrus, M. Buys, J. Miyamoto, S. Otto and N. A. Smart, Commission on Agrochemicals (Applied Chemistry Division) and published in PAC, Vol. 63, No. 5, pp. 747–762, 1991.



Dr Arpad Ambrus (Hungary) was one of the team responsible for preparing the 28th IUPAC Report on Pesticides.

Criteria that must be satisfied for the discovery of a new chemical element to be recognized

The following is the preface to this report. It was written by Prof. Yves Jeannin, President of IUPAC:

The discovery (synthesis) of a new element has become a very complicated matter because it now requires the intricate equipment of nuclear physics and because the number of atoms prepared is often extremely small. The very short half-life of many of the isotopes poses still further problems of experimentation. There has been considerable discussion and some disagreement concerning the discovery of the transfermium elements. Moreover, the discoverers are often interested in proposing names for the new elements they have synthesized. In some cases, it turned out that the first claim was later proved to be wrong. In other cases, the claim was well established and carried conviction. There are also examples where the first claim, although later shown to be correct, was based on experiments which were themselves not entirely conclusive so that further experiments were needed; clearly in such cases the discovery has to be shared. To clarify this situation a working group called Transfermium Working Group (TWG) was set up. Its members were nominated both by the International Union of Pure and Applied Physics (IUPAP) and by IUPAC since both physics and chemistry were involved in establishing the claims to discovery.

The present document is the Report of Phase (i) of the work of the Transfermium Working Group. It refers to the establishment of criteria that must be satisfied for the discovery of a new element to be recognized. The document has been reviewed and discussed by the three main laboratories involved in this difficult work, namely the Berkeley group, the Darmstadt Group and the Dubna Group, and has been accepted and cleared for publication by the two International Unions.

A second document named Report of Phase (ii) is under preparation. It will apply these criteria to the discovery of the transfermium elements and will report the considered conclusions of the Transfermium Working Group concerning the discovery of each of these elements.

This Report on Phase (i) of the operations of the Transfermium Working Group of IUPAC and IUPAP was prepared for publication by A. H. Wapstra and published in PAC, Vol. 63, No. 6, pp. 879–886, 1991.

English-derived abbreviations for experimental techniques in surface science and chemical spectroscopy

Surface science and the chemical spectroscopies have led in the literature and in oral presentation, etc, to the use of a large number of abbreviations for different experimental techniques. In some cases several different abbreviations have been used for the same technique and in many cases the abbreviations are understood by only a small part of the Surface Science/Spectroscopy community. Such a situation causes particular difficulties in communication for those with interdisciplinary interests. The present document suggests a systematic procedure for the generation of abbreviations which accords with many of those previously adopted. A survey is given of current principal abbreviations in these fields and recommendations are made which are either in accord with the systematic principles, or are so well-established that it would be unrealistic to suggest alternatives.

This report was prepared for publication by N. Sheppard, Commission on Molecular Structure and Spectroscopy, Physical Chemistry Division, and published in PAC, Vol. 63, No. 6, pp. 887–893, 1991.

Nomenclature, symbols, definitions and measurements for electrified interfaces in aqueous dispersions of solids (Recommendations 1991)

This document is devoted to electrical double layers on solid particles dispersed in aqueous solutions. Electrical parameters characterizing the double layer are defined and the steps and assumptions that are required to obtain these parameters from experiment are discussed.

This report was prepared for publication by J. Lyklema, Commission on Colloid and Surface Chemistry including Catalysis, Physical Chemistry Division and published in PAC, Vol. 63, No. 6, pp. 895–906, 1991.

A synopsis of the report was published as Provisional Recommendations in CI, Vol. 12, No. 1, p. 23, 1990. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of August 1990 were taken into consideration when preparing the final report.

Analysis of wet deposition (acid rain): determination of the major anionic constituents by ion chromatography

For the purposes of this document, only the major anionic constituents of wet deposition, i.e. chloride, sulfate and nitrate, are considered. The aim of the document is to provide a set of recommended procedures for the collection, handling, and analysis of acid-rain samples, and the quality assurance of the resulting data. The use of these procedures should result in greater comparability between laboratories and consequently improved reliability in data interpretation.

This report was prepared for publication by R. A. Durst, W. Davidson, K. Toth, J. E. Rothert, M. E. Peden and B. Griepink, Commissions on Environmental Analytical Chemistry and Electroanalytical Chemistry, Analytical Chemistry Division, and published in PAC, Vol. 63, No. 6, pp. 907–915, 1991.

Atomic weights of the elements 1989

The biennial review of atomic weight, $A_r(E)$, determinations and other cognate data has resulted in changes for nickel from 58.69 ± 0.01 to 58.6934 ± 0.0002 and for antimony from 121.75 ± 0.03 to 121.757 ± 0.003 due to new calibrated measurements. Because the measurement of the isotopic composition of mercury has also been improved during the last two years, the Commission was able to reduce the uncertainty of the atomic weight of this element from 200.59 ± 0.03 to 200.59 ± 0.02 . Due to the nearly constant isotopic composition of protactinium in nature, where ^{231}Pa is the predominant isotope, the atomic weight of this element was fixed to 231.03588 ± 0.00002 .

The *Table of Isotopic Compositions of the Elements 1989* is published as a companion paper to that on *Atomic Weights of the Elements 1989*. The *Table of Standard Atomic Weights Abridged to Five Significant Figures* and current data on isotopic compositions of non-terrestrial material are included to benefit users who are more concerned with the length of time during which a given table has full validity to the precision limit of their interest. The *Table of Atomic Weights to Four Significant Figures* was prepared and has been published separately.

This report was prepared for publication by the Commission on Atomic Weights and Isotopic Abundances, Inorganic Chemistry Division, and published in PAC, Vol. 63, No. 7, pp. 975–990, 1991.

Isotopic compositions of the elements 1989

The Commission's biennial review of isotopic compositions, as determined by mass spectrometry and other relevant methods, has been undertaken by the Subcommittee for the Isotopic Composition of the Elements (SIAM). The Subcommittee's critical evaluation of the published literature element by element forms the basis of the *Table of Isotopic Compositions of the Elements as Determined by Mass Spectrometry 1989*, which is presented in this Report. Atomic Weights calculated from the tabulated isotopic abundances are consistent with $A_r(E)$ values listed in the *Table of Standard Atomic Weights 1989*.

This report was prepared for publication by the Subcommittee for Isotopic Abundance Measurements, Commission on Atomic Weights and Isotopic Abundances, Inorganic Chemistry Division, and published in PAC, Vol. 63, No. 7, pp. 991–1002, 1991.

Methods for production of radical ions in low-temperature matrices for electronic spectroscopy

The methods and techniques of producing radical ions in low-temperature matrices are reviewed. The methods are compared and contrasted and recommendations are made where clear differences are found. The properties of various low-temperature matrix-forming materials are presented.

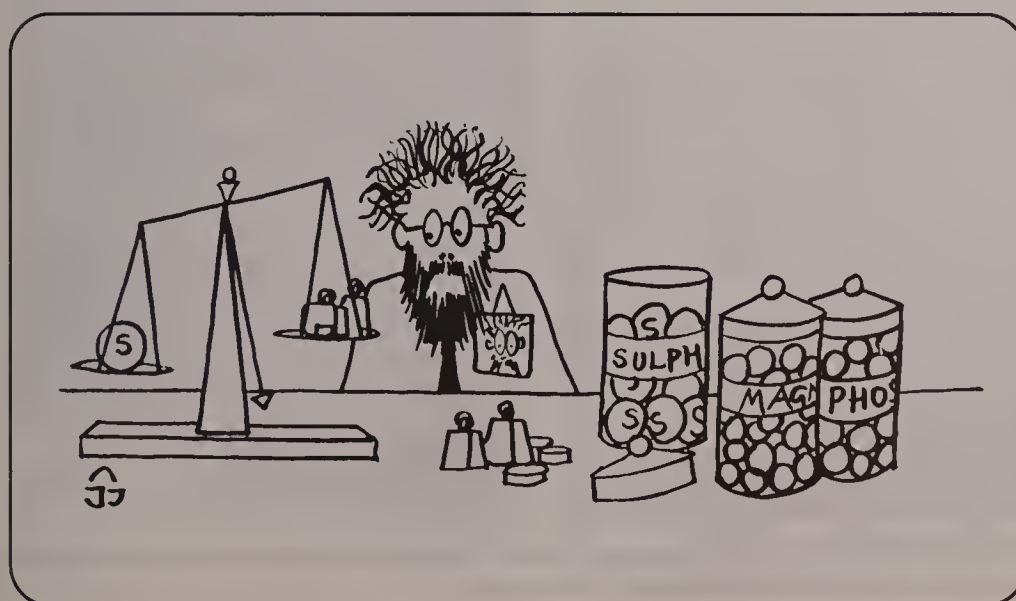
This report was prepared for publication by H. Iwamura and David F. Eaton, Commission on Photochemistry, Organic Chemistry Division, and published in PAC, Vol. 63, No. 7, pp. 1003–1014, 1991.

Critical evaluation of stability constants for nucleotide complexes with protons and metal ions and the accompanying enthalpy changes

The contents of this report are as follows:

1. Introduction;
2. Methods of evaluation;
3. Reported values;
 - (a) Nucleotide enthalpy changes reported;
 - (b) Nucleotide protonation constants reported;
 - (c) Nucleotide metal ion formation constants reported;
4. Discussion of constants;
 - (a) Enthalpy changes accompanying complexation;
 - Protonation enthalpy changes;
 - Alkali metal complex enthalpy changes;
 - Alkaline earth metal complex enthalpy changes;
 - Transition metal complex enthalpy changes;
 - (b) Protonation constants;
 - (c) Metal ion complexation constants;
 - Alkali metal constants;
 - Alkaline earth metal constants;
 - Transition metal constants;
 - Other metal constants;
5. Recommended values;
 - (a) Recommended nucleotide protonation and complexation enthalpy changes;
 - (b) Recommended nucleotide protonation constants;
 - (c) Recommended nucleotide metal ion complexation constants;
6. Bibliography.

This report was prepared for publication by R. M. Smith, A. E. Martell and Y. Chen, Commission on Equilibrium Data, Analytical Chemistry Division, and published in PAC, Vol. 63, No. 7, pp. 1015–1080, 1991.



Atomic weights '89.

150th Anniversary of The Royal Society of Chemistry

The Royal Society of Chemistry celebrated 150 years of chemistry during its 150th Anniversary Congress at Imperial College, London in April.

The Royal Society of Chemistry held its 150th Anniversary Congress at Imperial College, London on 8–11 April this year. More than 2000 delegates heard speakers, including Nobel laureates discuss, amongst other topics:

- milestones in 150 years of chemistry, from the discovery of synthetic dyes to the admission of women to Chemical Society Fellowship;
- going to work in Europe — the future for younger chemists; the effects of chemistry on the European economy;
- industry and the environment — oil, energy, water, and international trade in chemicals and chemical wastes;
- sensors, molecular robots, and new electronic materials;
- toxic chemicals and developing countries.

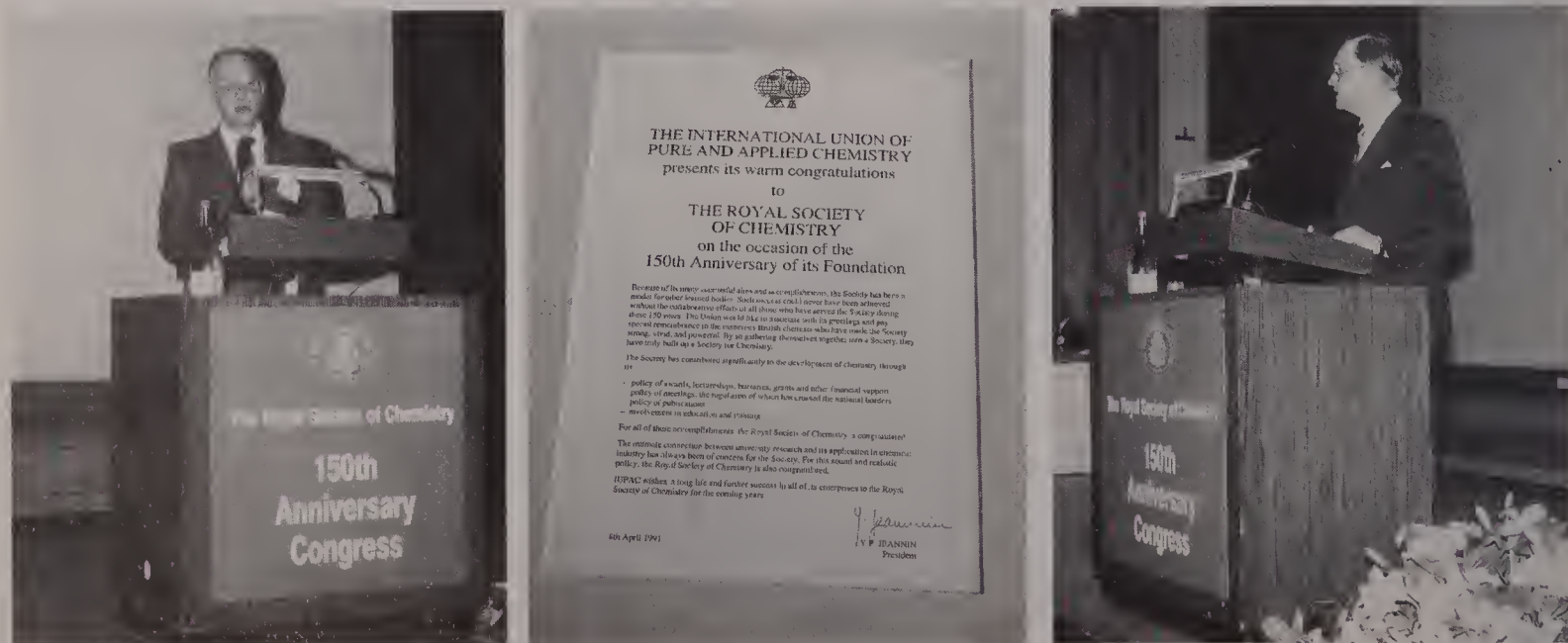
Professor John Ward, RSC Past-President and Chairman of the Anniversary Committee, opened the congress. His introduction was followed by addresses by Prof. C. W. Rees (Chairman, Local Committee); Lord George Porter (Guest of Honour); Sir Rex Richards (RSC President); Dr Wolfgang Fritzsche (Chairman, Federation of European Chemical Societies Council) — who became an Honorary Fellow of RSC; and IUPAC President Yves Jeannin who, during the afternoon, presented a scroll on behalf of IUPAC.

History

The Chemical Society was founded in 1841 with the main aim of advancing chemical knowledge. Its first president was Prof. Thomas Graham and at that time there were only 77 members. In 1848, the Society was granted its Royal Charter.

Over the next half century, other specialist organizations came into being: The Society for Analytical Chemistry (1874); the Institute of Chemistry of Great Britain and Ireland, later known as the Royal Institute of Chemistry (1877); and the Faraday Society (1903). RSC is the heir and successor to all these bodies and has the longest continuing tradition of any chemical society in the world. Following the unification of the Chemical Society and the Royal Institute of Chemistry in 1980, and the granting of a new Royal Charter, The Royal Society of Chemistry was formed.

The Society is, today, not only a learned body concerned with the advancement of chemistry, but also, as a professional institution, an upholder of professional standards. It is, furthermore, a major publisher. Its wide range of literature covers research journals, abstracts and indexes, educational publications and computer-based information services. The society also acts as a representative body providing information and advice on issues involving the science and practice of chemistry at all levels. It also seeks to advance the interests of



IUPAC President Yves Jeannin addresses the 150 RSC Anniversary Congress (left). He presented an IUPAC scroll (centre) to RSC. Dr Wolfgang Fritzsche (right) received an Honorary Fellowship at the meeting.



Sir Rex Richards is President of RSC.

members of the society in the context of the advancement of the science or practice of chemistry.

The headquarters of the Society are at Burlington House, Piccadilly, London, built originally in 1664–67 for the Earl of Burlington. New wings and a Piccadilly front were added in 1867, creating the quadrangle of buildings that now exists. Today, many of the Society's activities and 300 staff are based at the recently opened Thomas Graham House in Cambridge.

Current structure and work of RSC

The Society carries out a varied programme in education, information services, professional affairs, public affairs, membership affairs, qualifications, scientific affairs, and administration.

Each year the Society publishes over 20 000 pages of primary research in its journals: *Journal of the Chemical Society*; *Journal of Chemical Research*; *The Analyst*; *Journal of Analytical Atomic Spectroscopy*; *Analytical Proceedings*; and *Faraday Discussions*. It also publishes books of general interest to the chemical community; directories and data compilation.

Through its publishing and educational activities, and through its links with other chemical societies abroad, the Society's reach and influence are world-wide. The Society currently holds the secretariats of the Federation of European Chemical Societies, the European Communities Chemistry Committee, and is a member of the Council of Science and Technology Institutes, a UK group with representatives from all of the major scientific societies.

Following the disbanding of the Royal Society's British National Committee for Chemistry, the RSC established a British National Committee for IUPAC (BNCI) in order to retain a more direct link with the Union. The first formal meeting of BNCI was held in November 1990.

The Council, with 52 members, governs and controls the Society. It meets three times a year. The Society's Steering and Coordinating Committee advises Council on all matters which relate to the Society's activities and objectives. Five Boards,

reporting directly to Council, have delegated authority for executive action. Six specialist Committees report to the Steering and Coordinating Committee. The Finance Committee is responsible to Council. There is also a Benevolent Fund Committee and a Disciplinary Committee.

The Society has six divisions catering for the special scientific interests of members:

- Analytical;
- Dalton (inorganic chemistry);
- Education;
- Faraday (physical chemistry);
- Industrial;
- Perkin (organic chemistry).

Each division is governed by its own council and elects its own president. The Analytical, Education, and Industrial Divisions have regional structures based on groups of the Society's Local Sections. Over 60 Subject Groups are (in most cases) affiliated to the divisions. The Division and Subject Groups organize many conferences, which may be one-day symposia or longer residential meetings.

The Society has an extensive programme of endowed lectureships and industrially sponsored awards. It administers a number of funds in support of, for example, attendance at conferences and provision of bursaries, grants, studentships and fellowships.

Membership

The Society maintains a register of more than 42 000 members. There are four categories of professional membership — fellowship, membership, graduateship, and licentiateship — and also three other categories: associate membership, student membership and honorary fellowship.

All members receive the RSC news magazines *Chemistry in Britain* every month. The magazine is the Society's principal means of communicating with members.

Members are entitled to IUPAC affiliate membership. The programme is administered by Membership Affairs staff at Thomas Graham House, Cambridge. Over recent years almost 400 RSC members have registered as IUPAC affiliates each year.

For further information on membership or publications contact: Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge CB4 4WF. Tel: +44 (223) 420066; Fax: +44 (223) 423623. Telex: 818293 ROYAL. For information on international activities; professional, public and scientific affairs contact: Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN. Tel: +44 (71) 437 8656. Fax: +44 (71) 8883. Telex 268001 CHEMSO G.

Centenary of Geneva Conference Geneva, Switzerland 22–24 April 1992

'Organic Chemistry: Its Language and Its State of the Art' is the theme of a Commemorative Symposium on the Centennial Anniversary of the 'Geneva Conference' — the 1st International Conference on Organic Chemical Nomenclature. The Centenary of Geneva Conference will be held at the University of Geneva on 22–24 April 1992. The sponsors are: Swiss Chemical Society; Association of Swiss Chemists; American Chemical Society, Division of History of Chemistry; Ciba-Geigy; F. Hoffmann-La Roche; Lonza; Sandoz; Swiss Academy of Natural Sciences; University of Geneva; Comité Suisse de la Chimie; and IUPAC.

The first 'Geneva Conference' was convened in April 1892 in response to the internationally acknowledged need for a clear and unambiguous nomenclature related to chemical communication. The approach used in formulating the first small set of rules has continued to be the basis for successive revisions and of the ever-increasing extension of the rules. The international centennial meeting will commemorate the first conference and examine the history, diversity and state-of-the-art of organic chemistry.

The following 14 scientists will present invited lectures at the meeting:

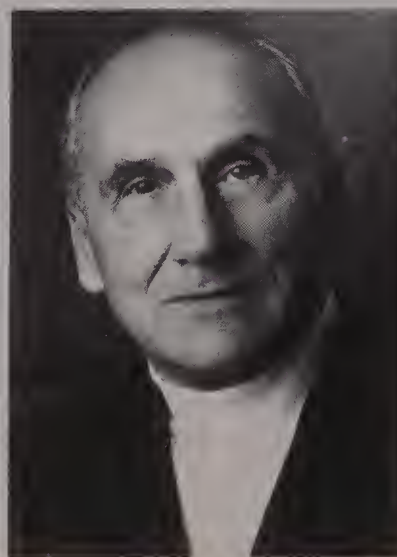
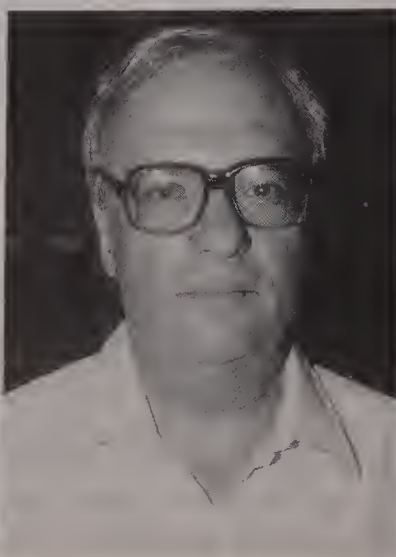
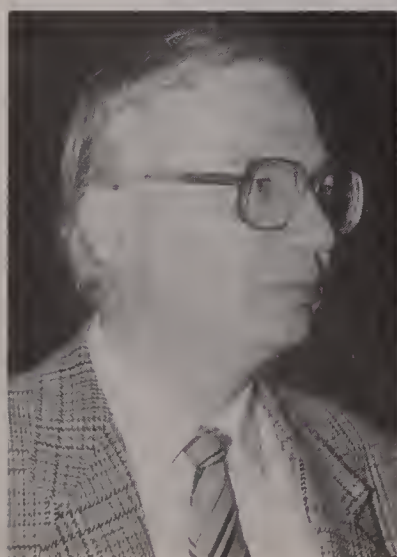
- Marjorie C. Caserio (University of California, Irvine, USA).
- Jack D. Dunitz (ETH-Zürich, Switzerland);
- Edward Godley (Laboratory of the Government Chemist, London, UK);

- Paul A. Grieco (Indiana University, Bloomington, USA);
- Louis S. Hegedus (Colorado State University, Fort Collins USA);
- M. Volkan Kisakürek (*Helvetica Chimica Acta*, Basel Switzerland);
- Jean-Marie Lehn (Université Louis Pasteur, Strasbourg, France);
- Kurt L. Loening (Topterm, Columbus, USA);
- Klaus Müller (F. Hoffman-La Roche AG, Basel, Switzerland);
- Wolfgang Oppolzer (Université de Genève, Switzerland);
- Leo A. Paquette (Ohio State University, Columbus, USA);
- Vlado Prelog (ETH-Zurich, Switzerland);
- Jack H. Stocker (University of New Orleans, New Orleans, USA);
- James G. Traynham (Louisiana State University, Baton Rouge, USA).

These lectures will be supplemented by a poster session. A special 'Centenary Volume' of the symposium papers will be published by *Verlag Helvetica Chimica Acta*.

Geneva is spectacularly situated on Lake Geneva between the Jura mountain chain and the Alps. Social events and sight-seeing excursions are being planned accordingly.

A ceremony marking the union of the Swiss Chemical Society and the Association of Swiss Chemists is planned to take place during the centennial symposium. A commemorative stamp marking the historical importance of the 'Geneva Conference' will be issued by the Swiss Postal Authorities.



Invited lecturers at the 1992 Geneva Conference: (from left) Jean-Marie Lehn (Nobel Chemistry Prize, 1987); Kurt Loening (Past Chairman of the IUPAC Interdivisional Committee on Nomenclature and Symbols); and Vladimir Prelog (Nobel Chemistry Prize, 1975 and Member of the IUPAC Commission on Nomenclature of Organic Chemistry, 1951–55).

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1991

New polymers

30 November–1 December. International Symposium on New Polymers. Kyoto, Japan. (Prof. Toshinobu Higashiura, Department of Polymer Chemistry, Kyoto University, Yoshida, Sakyo-ku, Kyoto 606, Japan.)

CHEMRAWN VII

2–6 December. World Conference on Chemistry of the Atmosphere: Its Impact on Global Change. Baltimore, Maryland, USA.

(CHEMRAWN VII Secretariat, c/o American Chemical Society, 1155, 16th Street, N.W., Room 205, Washington, DC 20036–4899, USA.)



CHEMRAWN VII: World Conference on Chemistry of the Atmosphere: Its Impact on Global Change will be held in Baltimore, Maryland, USA, on 2–6 December 1991.

1992

Enzymes in organic synthesis

6–9 January. International Symposium on Enzymes in Organic Synthesis. New Delhi, India.

(Dr V. S. Parmar, Department of Chemistry, University of Delhi, Delhi–110 007, India. Tel. +91 (11) (office) or +91 (11) 7115562 (home). Fax. +91 (11) 352471. Telex 78099–DU–IN.)

Centenary of Geneva conference

22–24 April. Centenary of Geneva Conference — Organic Chemistry: Its Language and Its State of the Art. Geneva, Switzerland.

(Dr M. V. Kisakürek, Editor, *Helvetica Chimica Acta*, Redaktion, Postfach 313, CH–4010 Basel, Switzerland.)

Biological and environmental reference materials

11–14 May. 5th International Symposium on Biological and Environmental Reference Materials (BERM–5). Aachen, Germany.

(Dr W. R. Wolf, Nutrient Composition Laboratory, United States Department of Agriculture, Beltsville, MD 20705, USA.)

Calorimetry and thermodynamics of biological processes

15–19 May. International Symposium on Calorimetry and Thermodynamics of Biological Processes. Fiskebäckskil, Sweden.

(Dr Lena Gustafsson, Department of General & Marine Microbiology, Carl Skottsbergs Gata 22, S–413 19 Göteborg, Sweden.)

Heteroatom chemistry

7–12 June. 3rd International Conference on Heteroatom Chemistry. Riccione, Italy.

(Prof. A. Fava, C.N.R. – I.co.-C.E.A., Via della Chimica, 8, I–40064 Ozzano Emilia–B0, Italy.)

Organic synthesis

28 June–2 July. International Conference on Organic Synthesis. Montréal, Québec, Canada.

(Prof. Jean-Claude Richer, Département de Chimie, Université de Montréal, C.P. 6128 succursale A, Montréal, Québec H3C 3J7, Canada.)

Ring-opening polymerization

7–11 July. International Symposium on Ring Opening Polymerization. Warsaw, Poland.

(R.O.P. Organizing Committee, Institute of Polymer Chemistry,

Polish Academy of Sciences, ul. M. Curie-Sklodowskiej 34, 41–800 Zabrze, Poland.)

Solubility phenomena

8–10 July. 5th International Symposium on Solubility Phenomena. Moscow, USSR. (Prof. V. M. Valyashko, N. S. Kurnakov Institute of General and Inorganic Chemistry, Leninsky Prospekt 31, Moscow, GSP–1, 117907, USSR.)

Computers in chemical research and education

12–17 July. 10th International Conference on Computers in Chemical Research and Education. Jerusalem, Israel. (Prof. Y. Wolman, Department of Organic Chemistry, The Hebrew University, Jerusalem 91904, Israel.)

Risk management of chemicals

13–16 July. International Symposium on Risk Management of Chemicals Can Chemicals be Used Safely? Guildford, UK. (Dr J. F. Gibson, Secretary (Scientific), The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

Macromolecules

13–18 July. 34th International Symposium on Macromolecules. Prague, Czechoslovakia. (IUPAC Macro 92 Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského nám. 18882/2, 16206 Prague 6, Czechoslovakia. Tel. +42 (2) 360317. Telex 122019 IMCP C.)

Coordination chemistry

19–24 July. 29th International Conference on Coordination Chemistry. Lausanne, Switzerland. (Prof. A. E. Merbach, Institut de

Chimie Minerale et Analytique, Université de Lausanne, Place du Chateau 3, CH–1005 Lausanne, Switzerland.)

Novel aromatic compounds

19–24 July. 7th International Symposium on Novel Aromatic Compounds. Victoria, B.C., Canada. (Dr R. H. Mitchell, Department of Chemistry, University of Victoria, Box 3055, Victoria, B.C., Canada V8W 3P6.)

Photochemistry

19–25 July. 14th International Symposium on Photochemistry. Leuven, Belgium. (Prof. F. de Schryver, Department of Chemistry, Katholieke Universiteit Leuven, Celestijnenlaan 200F, 3001 Heverlee, Belgium.)

Exploration, mining and processing of materials

2–7 August. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Randburg, Transvaal, Republic of South Africa. (The Symposium Secretariat, Mintek, Private Bag X3015, Randburg, 2125 South Africa. Tel. +27 (11) 7933511. Fax. +27 (11) 79324513. Telex 424867 SA.)

Macrocyclic chemistry

9–14 August. 17th International Symposium on Macrocyclic Chemistry, Provo, Utah, USA. (Prof. R. M. Izatt, Chemistry Department, Brigham Young University, 226 Eyring Science Center, Provo, UT 84602, USA.)

Chemical thermodynamics

16–21 August. 12th International Conference on Chemical Thermodynamics (ICCT). Utah, USA. (Prof. E. M. Woolley, Department of Chemistry, Brigham Young University, Provo, UT 84602, USA.)

Biotechnology

16–21 August. 9th International Biotechnology Symposium, Crystal City, Virginia, USA. (Dr D. I. C. Wang, Chevron Professor of Chemical Engineering, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139, USA.)

Natural products

30 August–4 September. 18th International Symposium on Natural Products. Strasbourg, France. (Prof. G. Ourisson, Centre de Neurochimie, 5 rue Blaise Pascal, F-67084 Strasbourg, France. Tel. +33 88600513. Fax. +33 88607620. Telex ULP 870260F.)

Macrocyclic ligands

13–15 September. International Symposium on Macrocyclic Ligands for the Design of New Materials. Guildford, Surrey, UK. (Dr Angela F. Danil de Namor, Chemistry Department, University of Surrey, Guildford GU2 5XH, Surrey, UK. Tel. +44 (483) 571281 ext. 2588. Telex 859331 G. Fax. +44 (483) 300803.)

Organic substances in soil and water

14–17 September. International Conference on Organic Substances in Soil and Water. Lancaster, UK. (Miss C. Martin, Centre for Research on Environmental Systems, Institute of Environmental and Biological Sciences, University of Lancaster, Lancaster LA1 4UQ, UK. Tel. +44 (542) 6520. Fax. +44 (524) 843854.)

Analytical chemistry

20–26 September. SAC 92: International Conference on Analytical Chemistry. Reading, UK. (The Secretary, Analytical Divi-

sion, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378658.)

Mycotoxins and phycotoxins

8–12 November. 8th International Symposium on Mycotoxins and Phycotoxins. Mexico City, Mexico.

(Dr D. L. Park, Department of Nutrition and Food Science, 309 Shantz Building, University of Arizona, Tucson, Arizona 85721, USA. Tel. +1 (602) 6215107. Fax. +1 (602) 6219446. Telex 187167 AZUTUC UT.)

1993

Bioorganic chemistry

7–10 June. 2nd International Symposium on Bioorganic Chemistry. Fukuoka, Japan.

(Prof. Yukito Murakami, Department of Organic Synthesis, Faculty of Engineering, Kyushu University, Hakozaki, Higashiku, Fukuoka 812, Japan.)

Boron chemistry

11–15 July. 8th International Meeting on Boron Chemistry

(IMBERON VIII), Tennessee, USA.

(Prof. G. W. Kabalka, Director of Basic Research, The University of Tennessee, Biomedical Imaging Center, 575 Buehler Hall, Knoxville, TE 37996-1600, USA.)

Solution chemistry

15–21 August. 23rd International Conference on Solution Chemistry. Leicester, UK.

(Dr M. J. Blandamer, Department of Chemistry, Leicester University, University Road, Leicester LE1 7RH, UK.)

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- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
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